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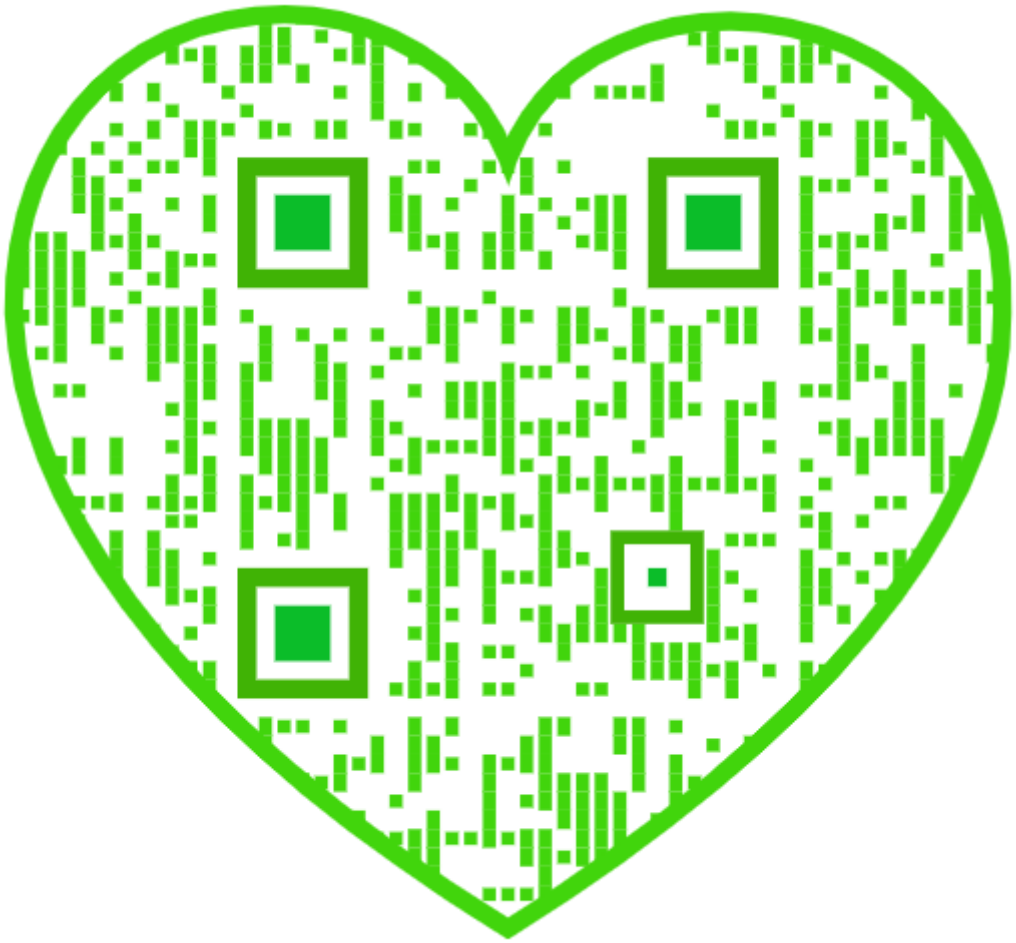
PRACTICAL CORN CULTURE

By

W. T. AINSWORTH
RALPH M. AINSWORTH



THE CORNFIELD THE DAY AFTER PLANTING

Notice the shallow furrows made by the furrow openers attached to the planter runners

PRACTICAL CORN CULTURE

Written especially for the

CORN BELT FARMERS

BY

W. T. AINSWORTH

Actively Engaged in Farming for Forty Years, and Still at It.

RALPH M. AINSWORTH

Secretary Illinois Corn Growers' and Stockmen's Convention.
Member Illinois Seed Corn Breeders' Association.

ILLUSTRATED

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"Oh, the corn, the royal corn, within whose golden heart there is of health and strength for all the nations."

—*Ex-Governor Oglesby.*

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BY
RALPH M. AINSWORTH

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PREFACE

DURING the past ten years great progress has been made in the cultivation and care of corn, both for seed and market. During this time few books have been written which have kept up with this progress. What has been written has pertained largely to the attacks of insect and fungous pests and to the selection and care of corn for seed.

Very little that would be of practical benefit to the busy farmer has been written on the culture of corn. We have long felt the need of such a book and have at length been induced by our friends to attempt the work ourselves. The result is seen in the volume now placed before the public.

Our aim has been to make this book up-to-date in every particular and to cover the entire practice of corn growing, from the cutting of the stalks in the spring to the selection and testing of the seed for next year's crop.

We have purposely started with the preparation of the seed bed because we know that some readers will start this book and will not finish it. If only a little is read, we are especially anxious that the reader get that part pertaining to the growing of the crop.

The writers are both actively engaged in farming seven hundred acres of land, and W. T. Ainsworth has been growing corn on his Cloverdale farm for over thirty-five years.

No apology is offered for the manner in which the subject is treated. The public must be the sole judge as to whether the book is deserving of commendation.

We do not claim originality for all of our methods since

many of our operations have been suggested by neighbors and the reading of bulletins and farm papers.

Changing conditions, from year to year, demand new and different methods of culture. The farmer, to keep abreast of the times, must be ready to adopt new ideas. If any of us should disregard the opinion of others and depend solely upon his own judgment for ten years, he would find that he would be left far behind in the march of competition.

We wish gratefully to acknowledge the sympathy, encouragement and suggestions which we have received from farmers in Illinois and in other states. To mention each one would be out of the question, but our gratitude for their kindness is none the less sincere.

Such rapid progress is being made in the methods of growing farm crops that this book will undoubtedly be a back number in less than five years. For this reason it is our intention to rewrite it every two years. If the reader will send a return stamped envelope we shall be glad to answer any questions, in our power, in regard to conserving soil fertility and the culture of corn.

W. T. AND RALPH M. AINSWORTH.

SUNNY SIDE FARMSTEAD,
Mason City, Illinois.
January, 1914.

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CHAPTER I

INTRODUCTION

Farmers in the United States are beginning to appreciate the fact that they are not raising as much per acre on their ground as do European farmers. This subject is being brought constantly to their attention by government bulletins, the agricultural press, farmers' institutions, etc. The early settlers on the soil found a virgin fertility which they did not stop to think would some day be exhausted; and they and their successors did little or nothing to compensate the soil for what they took out. We have now come to the point where the subject deserves our serious consideration. We must not only recognize the fact, but must act. The difference in productivity, however, is not due entirely to low soil fertility, but may be influenced by culture and by the time, method, and rate of seeding. Unquestionably each of these factors influence the yield to a considerable extent.

When crop prices were low in the United States, the excuse was often given that European farmers could farm better because their farm produce commanded prices which made intensive agriculture profitable with them but not with us. This may have been true twenty years ago, but during the last five years wheat, oats, and especially corn, have brought good prices, in some cases higher than the prices in Europe.

Present food prices for farm products are an incentive to better farming; if they continue wonderful strides should be

made during the next ten years. We believe present farm prices are here to stay, unless, perchance, they go higher.

Good Prices for Farm Crops

The last census shows that the population of the United States increases over twenty per cent every decade. This increase in population has been much greater than the increase in the available supply of land. The demand for farm crops has increased faster than the supply, with the result that farm crops and farm lands continue to bring higher prices. This is especially true of corn and corn land.

At least eighty per cent of the corn land in the corn belt proper is now under cultivation. If, then, we are to grow more corn in the future, it will be necessary to grow more bushels to the acre. More bushels mean better farming, and better farming requires not only more thorough and intelligent culture but the building up of the land and more careful selection of seed.

While we are confronted by depleted soils and the stern necessity of better farming, we are cheered by the fact that the resulting higher prices are making better farming exceedingly profitable. Twenty years ago the farmer was excusable for following bonanza methods (we have excused ourselves) with corn selling at fourteen cents per bushel.

From 1890 to 1895 it was necessary for the corn belt farmers to economize in every possible way in order to meet necessary expenses, to say nothing of buying manure spreaders and turning under leguminous crops. Automobiles did not exist, and if they had existed, the farmer could not afford to own one. During this period, careful farmers did well to play even; while with the majority farming was a losing game. Crops were often sold at a price which brought the farmer less than their value as a fertilizer.

Even as late as 1895 the corn belt farmer did not worry much over the fact that he was depleting his soil. Since the farmer had no surplus and no working capital his farming equipment was inadequate. Corn was not considered as being worth more than three cultivations. If he wanted more corn he planted more acres. During this period of low prices the farmer's outlook was not optimistic.

Let us take time to contrast this with the last five years on the farm.

During the summer and fall of 1908, with corn at sixty cents on the farm, prices of farm crops rose to a new high level; and if our memory does not fail us, it has been worth at least fifty cents per bushel (sometime during the year) for the past five years. At the date of this writing, corn is bringing sixty-five cents at the country elevators. With hogs and cattle at eight cents per pound there is surely a margin of profit large enough to give the thorough farmer a working capital, and a working capital means better farming.

Investing the Farmers' Surplus

With corn land selling at $150 to $300 per acre, we believe that an investment of this surplus in manure spreaders and in the growing of leguminous crops to be returned to the land will bring greater returns in dollars and cents than the use of this money or credit for the purchase of more acres. There are indications on every hand that farmers as a class are beginning to appreciate this fact and to realize that it does not pay to practice crop rotations that do not include the turning under of at least one leguminous crop every five years.

Another good use to which this surplus may be put is the improvement of equipment by acquiring more horses and better implements with which to do more thorough farming. What is more pathetic on the farm than to see one man trying

to do the work of two or three. Our own experience has taught us that too much work can hardly be put on good corn ground when the crop is worth from fifty to sixty-five cents per bushel. In every case additional work with us has meant an increase in the margin of profit.

Spurred on by this we have gradually increased our farm equipment until today we are employing considerably more men by the year than we did ten years ago. Although we grow fewer acres of corn and small grain, we have many more horses in the field. This increase in equipment for the purpose of better farming, (including the building of houses for farm help), has cost us several thousand dollars, but what are the results?

In the first place we are building up our farms by having more time to haul manure from town. With three spreaders we haul annually eight hundred tons of manure from the town of Mason City. (See Chapter VII.) We are growing on an average fifteen bushels of corn more per acre than we did as late as ten years ago. With better land to start with we are able to cut the stalks and double disc before plowing, where corn follows corn. The corn is cultivated four to six times, the last time being with a high arch gopher cultivator. If the corn is too thick, it is thinned and suckered after the last plowing. This sums up briefly what we are accomplishing with our additional investment in equipment.

We are sure that what we have invested along the line of more intensive farming has paid us well in dollars and cents, and still better in satisfaction. What we have done is being done by others and can be done by every land owner and farmer in the corn belt.

What about the tenant farmer? Many tenant farmers are among our best farmers and the tenant really has the same opportunity as the landlord farmer, provided he has been given a long term lease. A tenant would be more

than human if he tried to build up a farm when he felt that his successor would reap the benefits of his labors. A five-year lease with privilege of renewal, we consider a good fair lease for an appreciative tenant who has first been tested out on a one or two year lease.

Four Factors Determine the Yield

Before taking up the culture of corn in detail, let us state briefly the four factors which enter into the producing of a crop of corn. They are: Culture, Soil, Seed and Climate. In the first three chapters comprising culture we shall ask the reader to go with us into the fields and stay with us until the crop is laid by.

In the four chapters entitled "Building up the Land," we shall explain the methods followed by experiment stations and the best farmers in their efforts to increase the fertility of their farms. In addition to this, we give the results of our own experience with rotations, manure and fertilizers.

The remaining chapters deal with the breeding, selecting, drying and testing of corn for seed. All field and corn illustrations in the following chapters have been taken on our own farms during the crop seasons of 1912 and 1913.

PART I

CULTURE

CHAPTER II

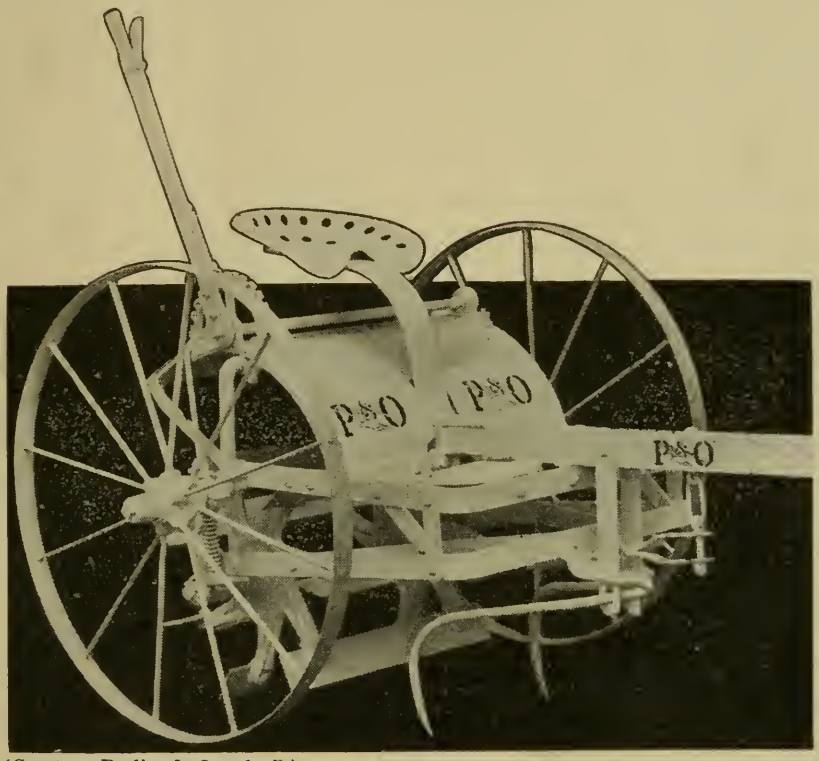
Preparing the Seed Bed

Iron-clad rules cannot be laid down for preparing a seed bed for corn. The methods suggested in this chapter have been found practical on our own farms and have been tested out from two to ten years. Our soil is a black level silt loam, with a deep, porous subsoil that makes a natural drainage for surface water. A heavier soil would need more rolling, and a lighter one would need less; so the farmer who would benefit from reading this chapter should compare each operation carefully with his own practice and not make a change until he has satisfied himself it is adapted to his local conditions.

There is a great diversity of opinion among farmers as to the best method of preparing a seed bed. There is not this difference of opinion as to what constitutes a good seed bed. The best farmers agree that an ideal seed bed, to be in good physical condition when the time comes to plant corn, must be aërated and not run together. The soil particles must be fine and free from lumps or clods. A maximum amount of moisture is conserved in the subsoil by having a shallow dust mulch on the surface. A large number of weed seeds have been sprouted and all that show on the surface have been killed immediately before planting. We

try as nearly as possible to have these conditions at planting time. Our success varies with the season and the equipment that we can put in the fields.

The implements used are those most commonly found in Central Illinois, namely: two-row stalk cutters, single disc harrows (disc pulverizers), gang and sulky plows, spike tooth



(Courtesy Parlin & Orendorff.)

SINGLE-ROW STALK CUTTER

harrows and a corrugated roller. All these implements, including the harrow teeth, should be as sharp as the blacksmith can get them before spring work sets in. Five dollars paid the blacksmith in getting tools in shape will save many times that amount in horseflesh, besides doing a much better job in the field.

Work on Ground before Plowing

The stalk cutter should be the first implement in the field when corn follows corn. Unless the fields are very small, a two-row cutter should be used in place of a single row. In the first place, it gets over the ground twice as fast as a single row cutter, and owing to its greater weight and better balance does a much better job. The two-row cutters have two tongues and are drawn by three horses. With this implement a good fast team will cut twenty acres in one day. All the stalk cutters we have ever tried have been satisfactory; but the farmer who has never used a stalk cutter must not expect it to cut every stalk if the stalk growth is rank and heavy.

If the stalks are heavy it will be necessary to follow with a disc harrow—either single or double discing. Where a stalk cutter is followed by a sharp disc, lapping half each time, the heaviest growth of stalks will be cut and the ground left level ready for the plow. If the ground is single disced after the cutter it is advisable to have the horses walk on the ridges. This cuts down the ridges and leaves the ground fairly level.

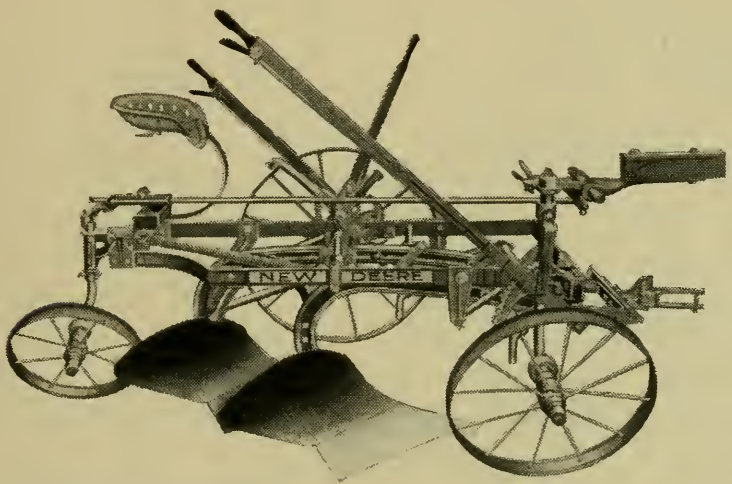
For several years we dispensed with the use of the stalk cutter in preference to double discing; but the objection to this method was that the standing stalks continually worried the team and the time lost would almost amount to the time required to cut the stalks.

When practicable, it is a good plan to run the stalk cutter on afternoons only, since the stalks are dryer and the cutter does a much better job. The disc will do nearly as good a job in the forenoon as it will in the afternoon.

We have tried breaking the stalks before discing, but the results were very disappointing, since the stalks became so

bunched between the rows that the disc, although very sharp, would often ride over them.

When we first started, several years ago, to cut the stalks on ground to go in corn, we felt that the objections would almost offset the advantages to be gained. The stalks would clog under the planter runners, and during the first cultivation many hills of corn would be lifted out by the cultivator shovels catching the stalks. This was due to following directly after the stalk cutter with the plow and the stalks



(Courtesy John Deere Plow Co.)

FOUR-HORSE GANG PLOW
This plow has two 12-inch bottoms

were not cut up sufficiently to turn under. During recent years, when the stalks were properly cut up and turned under as early as the 20th of April, we have had little trouble with their bothering during corn cultivation. When the stalks are turned under as late as the 10th of May, some little difficulty may be experienced in cultivating the first time.

The question is often asked: Will soil dry out more quickly when the stalks are turned under? The answer is,

if the stalks are turned under as early as the 15th of April, they will be thoroughly water-soaked and partially rotted by the time the corn is cultivated the first time. Stalks add some humus to the soil the first year, and the more humus there is in the soil, the better its moisture retaining qualities.

Decaying stalks are very beneficial in keeping the soil loose. Loose soil allows the water to soak into the ground during a rain. On the other hand, hard packed soil will shed most of the rainfall off, especially on hilly ground. On hillsides, plowing stalks under is an additional benefit in that it prevents washes.

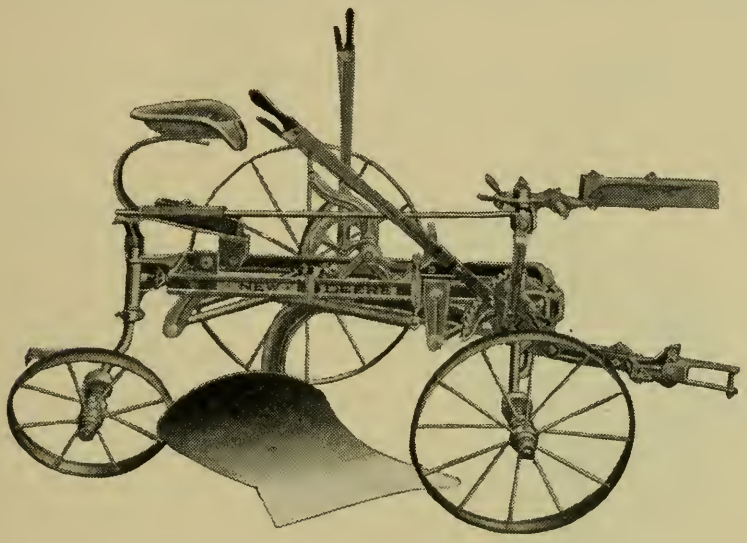
Discing before plowing serves a three-fold purpose. It cuts up the stalks, levels down the ridges, and pulverizes the top soil, making a mulch of from two to four inches in depth. This mulch aids greatly in the re-establishing of capillarity between the furrow slice and the bottom of the furrow. Pulverizing improves the physical condition of the soil by cutting up clods which could never be broken after they had been turned under. It is the buried clod that is more detrimental than the one on top. We consider the disc fully as important an implement on the farm as either the plow or the harrow. Our discs are kept bright and sharp and are used over more acres than are the plows. Before the corn is planted, the field is disced at least once. By discing before and after plowing the furrow slice is pulverized clear through.

Importance of Good Plowing

Since plowing is the slowest and most expensive of any single operation on the farm, every effort should be made to do it right. The furrow should be straight and uniform in width and depth. The furrow slice should be clear cut and all of the dirt moved. This does not mean that there should

be a complete inversion of the furrow slice. With the exception of heavy sods it is better to have the furrow slice slightly on edge since it will work up more easily than if completely inverted. The ends sought in plowing are to alter the texture of the soil and to bring to the surface new soil; to bury completely all vegetation and trash and to pulverize and aërate the soil.

This pulverizing and aërating of the soil we consider the chief objects of plowing. The plow may invert the soil in



THREE-HORSE SULKY PLOW
This plow has one 16-inch bottom

the most perfect manner, but if the plow fails to do the greater part of the pulverizing of the soil as well, and leaves it in such condition that the disc and harrow cannot finish the work in the cheapest and best manner, it is failing to accomplish its principal function.

This pulverizing of the furrow slice is done largely by the twist of the moldboard. For that reason a moldboard having a medium twist should be used. At present we are using four

standard makes of gang plows on our farms, and the one with the shortest twist is doing the best work. We cannot see but that it pulls as easy as the others. Since we have never tested out the drafts of different twists of moldboards we will quote from Prof. Roberts as follows:

"About 35% of the power necessary to plow is used up by the friction due to the weight of the plow, and 55% by the severing of the furrow slice and the friction of the landside. If, after having done nine-tenths of the work, the plow allows the furrow slice to escape without the greatest possible amount of disintegration, great loss is sustained because the bolder and more efficient moldboard may add but two or three per cent to the draft."

Fall Plowing

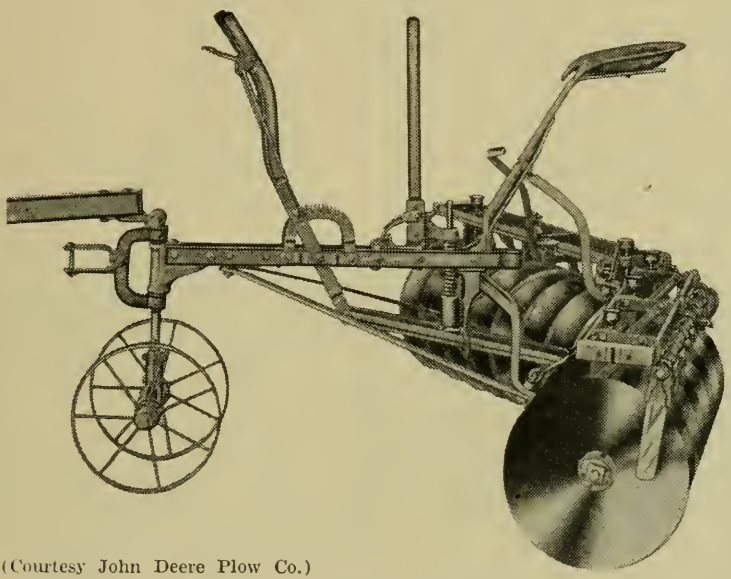
We cannot recommend fall plowing of ground in Central Illinois, except in the case of heavy sods which require the erosion during the winter months to disintegrate the soil sufficiently to work into a seed bed. Fall plowed ground leaches badly unless plowed very late. Without a cover of any kind, soil will wash during the early spring months, even on land that is considered fairly level. To fall plow hillsides is to invite the formation of deep gulleys which will soon make the field fit only for pasture land.

There are, in our opinion, just two good reasons for fall plowing: First, the work is done at the slackest time of the year when both men and teams might otherwise be idle. Secondly, if the plowing is done late, it affords a splendid opportunity to kill cutworms and other insects while they are lying dormant in their winter quarters. During the last five years we have fall plowed about ten per cent of our corn ground and have winter plowed about five per cent. We do not hesitate to plow clover sod in the winter time if the

ground is not too wet. In this latitude there is only about one winter in four when plowing is possible because of the frost.

Spring Plowing

Fields which have been in corn the previous year must, of necessity, be plowed in the spring. Just how early spring plowing can start depends largely upon the weather during



(Courtesy John Deere Plow Co.)

FULL DISC HARROW WITH TRUCK

One of the necessary implements on the farm

March and April. A wet spring will delay plowing even on well drained fields. So long as the furrow slice and the particles of soil run together rather than crumble, plowing had better be postponed, unless the plowing is done very early in the spring and is followed by several frosts.

There is no logic in the expression that "if ground is plowed wet it should be worked wet all summer." Owing to the rush of spring work we have sometimes plowed ground

when it was too wet. The results have always been very unsatisfactory, since a dry August will make the corn fire much more quickly than it would had the ground been broken at the right time. In plowing stalk ground that has first been disced, it is well not to allow too much time to intervene between the two operations. It is a good plan to harrow each morning what has been plowed the previous day. Time is gained rather than lost by this practice since the plowed ground must be harrowed and disced several times before a satisfactory seed bed can be made. An hour's work on freshly plowed ground will do more toward making this seed bed than can be accomplished in two hours' time after the wind has been allowed to dry out the surface.

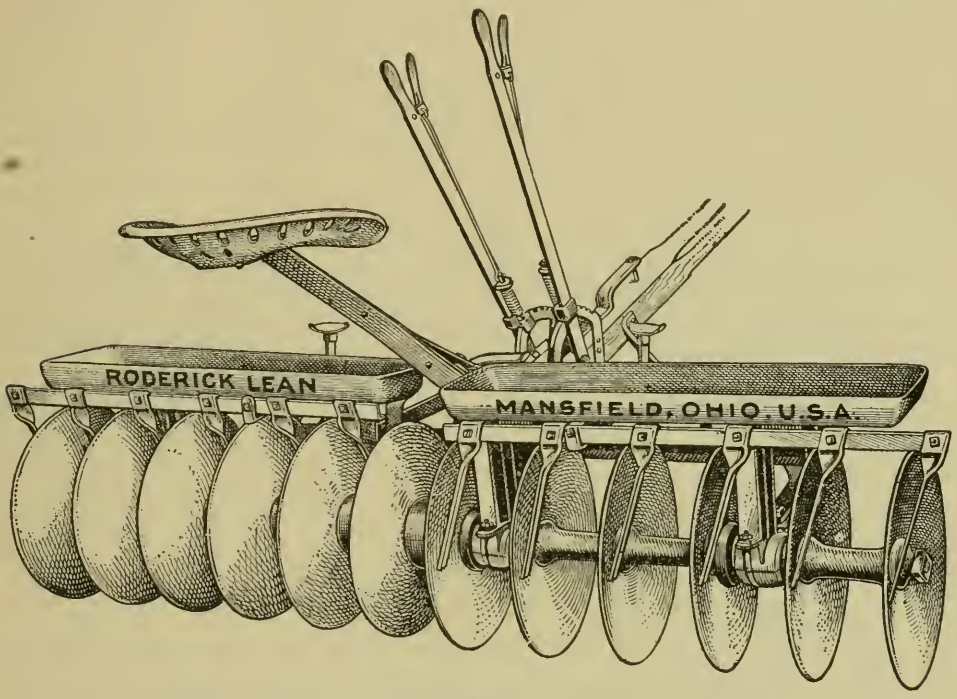
Another good reason for keeping plowed ground harrowed is to conserve the moisture. One man and four horses with a 120-tooth harrow will get over from twenty-five to thirty-five acres in one day. This will prevent the escape of more moisture and consequently will grow more bushels of corn than if an additional five acres had been plowed and the moisture allowed to escape from the thirty acres.

The argument is often advanced that spring plowed ground should not be worked down until the time to plant the corn since beating rains would make the soil too compact. This idea is wrong. If hard rains do come and pack the soil, an almost ideal seed bed can be secured by single or double discing. If the looked for rains do not come, the farmer who has worked his ground as he went along may have a seed bed when it would be impossible, even with double the work, to make one where the ground had been allowed to lie until planting time.

Every effort should be made to get the fields all plowed and harrowed down before the weeds have an opportunity to grow up in the stalk fields. A growth of weeds before

plowing is injurious to the physical condition of the soil, since it makes it compact and allows a rapid evaporation of moisture. When the weeds are turned under later in the spring, they destroy the capillarity between the furrow slice and the bottom of the furrow.

The necessity for cutting stalks, discing, plowing and harrowing the corn ground—all within a short period of three



FULL DISC HARROW WITHOUT TRUCK

A popular disc in Illinois

or four weeks—has brought about what the farmer calls "the rush of spring work," but there is no way to get around it if one expects to do good farming.

A great many agricultural writers (not many of them active farmers, however) advocate eight hours as being all a man and team should be made to stand in the field. This may be all right from an ethical standpoint; but every farmer

knows that it is impossible to hire extra men and teams on short notice. When "rainy days off" are taken into consideration, we think that a ten-hour day is not too much to ask of either man or team. Most of our own farm help come from Kentucky, where they are accustomed to plow from "sun to sun," and consider ten hours in the field a short day's work.

Depth of Plowing

The depth to which ground should be plowed in order to give the best results must, of necessity, vary with conditions. There is, perhaps, no subject on which farmers and writers differ so widely as on the matter of the depth of plowing. One writer says "deep plowing of sandy land is not advisable, particularly in the spring. On clay land deeper plowing should be the rule." On the other hand, a corn lecturer of national fame says: "What is known as deep plowing is generally not advisable in the corn belt, although the loose soils and bottom-lands may be plowed much deeper than the black prairie soils with less danger of bad results." While these two statements are not altogether contradictory, they have, at least, a tendency to leave the reader in doubt.

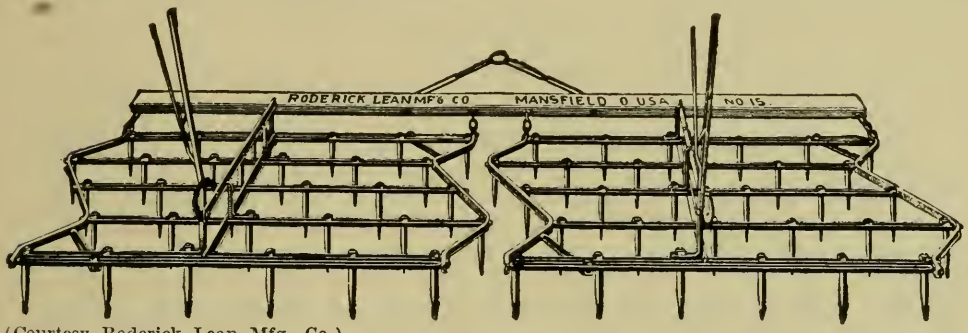
In order to make ourselves more clearly understood, we shall state that we consider six inches and over deep plowing, and four inches and under shallow plowing. Plowing from four to six inches deep may be considered as medium deep plowing.

Deep Plowing

The advocates of deep plowing claim that since a loose, porous soil has a greater moisture holding capacity than a more compact soil, the deeper the plowing the more moisture will be retained. Deep plowing allows plant food to get

deeper into the soil and thereby extends the feeding zone of the root system.

Hillsides do not wash so badly when plowed deep, since the rain can sink more easily into the soil than would be the case if plowed shallow. If the plowing is going to be deeper than six inches, it had best be done in the fall because the fall rains, aided by the freezing and thawing of winter and spring, will re-establish the capillary connection with the subsoil. This capillarity is necessary for a good seed bed and is not so readily re-established with deep plowing as where the plowing is shallow.



(Courtesy Roderick Lean Mfg. Co.)

SPIKE-TOOTH LEVER HARROW

Plowing should not be at the same depth from year to year, since such a practice does not mix the soil well and the pressure of the plow and trampling of the horses will, in time, solidify the bottom of the furrows. Where land has been plowed four or five inches deep for a number of years, we know of nothing that will make the farmer more money for the added effort involved than to plow such land six or seven inches deep and break up the crust.

We plow from five to seven inches deep, depending on the time of the year, the condition of the ground, and what we are turning under.

In fall plowing for corn we plow from six to seven inches,

or as deep as the team can pull the plow. When we are turning under soy beans, however, the plowing is shallow in order to allow the plants to rot more quickly. This ground is plowed deep in the spring when the beans are put in.

In plowing stalks under we try to plow six inches deep, if the ground is dry, since the stalks are covered better than in plowing four or five inches deep. Never try to cover stalks with only four inches of soil when the field is to go in corn. Subsequent cultivations will drag them out and they will be a continual source of annoyance throughout the crop tending season.

Plowing Sod

Blue-grass sod, or ground that has been in pasture for a number of years, should be plowed in the fall. In plowing blue-grass it is a good plan to plow very shallow in the fall and follow with a plowing at least two inches deeper in the spring. This is more work than is necessary to break any other sod with which we are familiar. If the sod is very tough, a wide angle moldboard should be used. This will pull more easily and will turn the sod under much better than the general purpose plows found on most farms. Clover and timothy meadows that constitute a part of the short crop rotations of the corn belt seldom become sodded enough to necessitate the use of the sod plow.

If sod is plowed in the spring it should be done early. Wet sod, although it turns up slick on the bottom of the furrow slice, will not bake and become cloddy because of the presence of such an abundance of humus. Owing to the rush of farm work in the spring every effort should be made to get the sod plowed by the time the corn stalk land is in condition to work.

In some cases it might be well to break clover sod late in order to enrich the land with the greater amount of nitrogen

stored in the additional growth of clover. This plan is very satisfactory if there be sufficient rainfall during May and June. In the case of a dry summer, the clover will have already used up a large part of the moisture stored in the soil so that there is but little left for the corn. Our own experience with early and late plowed clover sod showed a difference in the yield of corn of nearly thirty bushels in favor of the early plowing. This was in the spring of 1911.

In 1911 there was ample rainfall during May and the first half of June. As a result, late plowed clover sod made a good showing. This year (1913) has been hot and dry, and corn planted on late plowed sod has been almost a failure, while some early spring plowed clover sods have made as high as seventy bushels.

Preparation of Plowed Ground before Planting

An ideal seed bed, as stated in the beginning of this chapter, should be aërated and not run together. At the same time, the soil particles should be compressed closely around the seed in order to insure quick and even germination. A maximum amount of moisture should be conserved in the subsoil by having a shallow dust mulch on the surface. Last, but not least in importance, a large number of weed seed would have sprouted, and all that show on the surface should be killed immediately before planting. When the greater part of the weeds are killed before planting and the seed bed is moist and free from clods it can safely be said that the crop is half provided for.

Since the method of preparing the seed bed is determined largely by the local condition of soil and climate, we shall not attempt to give general directions for working the ground which might apply to one farm but not to another. Instead, we shall outline the methods followed on our own farms.

As we have stated, each day's plowing is harrowed the next morning. If a hard rain comes, all the ground previously plowed is again harrowed before proceeding with the plowing. If the rainfall is very heavy and many weeds have started, the ground is single pulverized in place of being harrowed.

This year we had no rain on over two hundred acres from the time the ground was plowed until after the corn was planted. This was a period of four weeks without even a shower. No amount of work could make an ideal seed bed under such conditions. We did what we could to pulverize the soil and conserve what moisture we had. After the ground had been plowed and harrowed twice, it was rolled with a corrugated roller. This was followed immediately with the disc harrows lapping half.

When the discing was finished, the ground was harrowed cross-wise of the discing. This harrowing pulled most of the clods to the top. For this reason we followed the harrow with a second rolling. The fields were then harrowed twice by lapping half and followed immediately by the planter equipped with furrow openers.

Double discing is a slow operation. At the same time, it is the best implement we know with which to preserve moisture, facilitate seed bed preparation, and hasten decay of organic matter. A sharp, bright disc with the levers set well forward will work in and through the furrow slice; while smoothing harrows and corrugated rollers work only the surface. Four good horses and an eight-foot disc harrow will double disc (lapping half each time and leaving the ground level) forty acres in five days. Repeated discings, by keeping down all vegetable growth, will destroy, by starvation and exposure, all such insects as the corn-root louse, cutworms and grubworms.

On most soils, with a normal amount of rainfall in the spring, the roller is not needed to prepare the seed bed for corn. Two harrowings with a double discing between, just before planting, will put the seed bed in ideal shape three years out of four.

We seldom roll directly ahead of the planter and never behind. Our experience has been that rolling causes the weeds to start quickly, which is not desirable after the corn is planted. Some implement should precede directly ahead of the planter in order to get a last whack at sprouted weed seeds before planting. If disc markers are used, the driver of the planter will have a plain mark in the freshly worked dirt. The use of the disc marker does away with the necessity of rolling in order to see the mark.

Have Sufficient Equipment

We know by experience that sufficient time is not often given to the preparation of the seed bed before planting. This is due mostly to having more ground in corn than can properly be prepared and tended. In the corn belt, where corn is king, it takes nearly twice as many horses and men to handle eighty acres of corn as it does to handle forty acres. Very often it is better to cut down the corn acreage rather than go to the expense of buying more equipment.

The farmer should be prepared to handle his field work on unusual seasons when additional work is required to make a proper seed bed. No one can say beforehand how much work will be required to get a field in shape for planting. A field of clover sod that is plowed in the fall can sometimes be put in good shape with a single discing and one or two harrowings. It is usually better, however, to double disc if for no other reason than that the ground is left level.

An example of a field that required a great deal of work was a blue-grass sod that we plowed shallow in the fall. This field was double pulverized twice, harrowed three times and rolled once—and then was not in good shape for planting the corn. The winter was dry and the sod did not rot as it usually does. If this field could have been plowed about five or six inches deep it would not have required so much work in the spring. We know of a stalk field where the stock were allowed to run late, that broke up so cloddy that it required six alternate rollings and harrowings to make a seed bed. Although there were some clods left, the field produced eighty-five bushels to the acre and the farmer was well paid for his thorough work.

Frank Mann sums up this situation when he says: "There is no way to get ground in good condition except to work it, and the worse condition it is in the more work is needed."

Some soils require more work than others. Additional implements can be purchased on short notice, but men and horses have to be arranged for in advance. One can never tell how much time one will have in which to prepare ground in the spring for corn. In this latitude we do well to get our oats in by the fifth of April. If the weather is favorable and the ground warm, we start planting corn by the fifth of May. If wet weather kept us out of the field a week or ten days in April, we have only three weeks in which to prepare the corn ground. In our own practice we average using one horse for every eight acres that we intend to put in corn. Some of these are brood mares and are used only during the preparation of the seed bed, when every implement requires four horses. We consider this ratio about right for the average season. Sometimes we could get along with fewer horses, but more often it would pay us to have more.

CHAPTER III

PLANTING

When to Begin Planting

Since the most mature corn is always the result of early planting, the farmer should make every effort to have his ground in shape by the time of year that planting is generally begun. Then, if the ground is too cold, he should wait until it warms up. We have made numerous germination tests which have convinced us that corn will not germinate or grow to advantage when the temperature of the soil is below sixty degrees. If the temperature is below fifty degrees for a week or ten days, some of the sprouted grains, although the seed is of the very best, will rot in the ground.

From the fifth to the twentieth of May is considered the best time to plant corn in Central Illinois. The time varies, in any locality, from one to two weeks, depending on the soil and the weather. In the western part of Mason County, which is very sandy, planting can safely be started a week or ten days earlier than in the eastern part, where there is a heavier loam which does not warm up so quickly as the lighter soil.

An old-time general rule was to "Plant corn when the leaves on the white oak tree are as large as a squirrel's foot." There is considerable significance in this fact, as the oak is tardy in showing its leaves until the ground has had its spring warming. Another good rule is to wait until volunteer corn has started to grow around the cribs and barns. If the season is very backward and the weather-man assures us that warmer

weather is on the road it is sometimes advisable to start planting even if the ground is a little cold, in order to finish before the season is too far advanced. At the Illinois Experiment Station at Urbana (latitude forty degrees), a six year's test shows the largest yield to come from corn planted May 4th to 9th.

Proper Depth of Planting

The depth of planting, like the time of planting, is governed to a considerable extent by the nature of the soil and the amount of moisture near the surface. On warm, light soil, corn should be planted deeper than where it is cold and heavy. Again, the depth of planting will be governed largely by the time of planting. In early planting, only the surface soil is warm enough to germinate the kernels. The subsoil is still wet and cold. Later, when the surface soil has become warmer and dryer, the seed may be planted deeper.

In planting corn, the fact must be kept in mind that for quick germination plenty of air and warmth are just as essential as moisture. Nine years out of ten there is enough moisture in the soil to sprout the corn, although the season of 1913 was an exception. It was then necessary to plant about four inches deep in Central Illinois in order to provide sufficient moisture. While we planted over four inches deep the season mentioned, we used furrow openers on the planter runners so that by throwing out a furrow it was not necessary to cover the seed with more than two inches of dirt. We always use furrow openers on our planters and vary the depth of the furrow according to the condition of the ground, but in no case do we cover the seed with more than two inches of dirt. About one and one-half inches over the seed seems to bring the best results on our brown silt prairie soil.

Repeated experiments have proved that plants cannot be made to send their roots deep into the soil by planting deep.

If the object is to fortify the plant against dry weather, it is best to plant the seed in a furrow and then gradually cultivate the furrow full of soil as the plants grow.

In an experiment at the Illinois Experiment Station, covering a period of five years, corn was planted at depths ranging from one inch to seven inches. The greatest yields resulted from planting one inch deep.

YIELD IN BUSHELS PER ACRE FROM CORN PLANTED AT DIFFERENT DEPTHS

Year	DEPTH PLANTED IN INCHES							Station
	1	2	3	4	5	6	7	
1888.....	109.7	84.4	100.8	88.0	73.1	60.3	.....	Illinois
1889.....	83.0	83.0	51.0	87.0	81.0	92.0	.....	
1890.....	77.8	72.8	70.3	58.4	62.3	60.3	.....	
1892.....	65.8	64.7	62.7	70.3	56.5	58.5	40.5	
1893.....	51.3	48.7	40.7	40.0	33.4	29.0	.....	
Average	77.5	71.5	65.1	68.8	61.2	60.0	40.5	

NOTE: The above table was taken from Bulletin No. 31 Illinois Station. The soil at the experiment station is a deep retentive prairie soil.

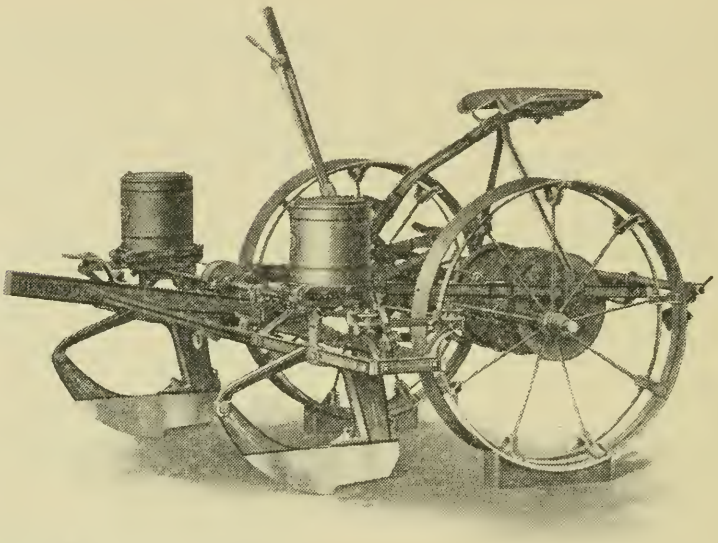
Too deep planting is the rule rather than the exception, especially in the case of early planting when the ground is still cold. We know of ten cases where poor stands are the result of too deep planting where one case is the result of too shallow planting. If it is necessary to get the seed into the ground, use furrow openers which will cover at a uniform depth, besides throwing all the clods out of the furrow.

DRILLED CORN

The advantage of drilling corn is that one kernel is dropped in a place. Standing singly as it does, each plant has a fairer chance both below and above the ground to develop normally and produce well. It requires less care

to drill than to check. This is especially true of timberland that is covered with stumps.

Drilled corn is not so liable to blow down in heavy summer winds. We believe, however, that this advantage is fully offset by the freer circulation of air through fields planted in hills. A free circulation of air around the corn



(Courtesy John Deere Plow Co.)

MODERN CHECK ROWER PLANTER

plants in August has a tendency to prevent firing. We sometimes drill sod fields if the ground is free from weeds.

Three styles of modern planters are used in planting corn in hills: the round hole, or hill drop, the cumulative edge drop, and the kernel spaced edge drop. All of these are operated with a wire to check off the kernels in the hills.

Round Hole or Hill Drop: This is the least complicated and the easiest to keep in repair of the check-rower planters. The round holes in the plates are large enough to admit all

the kernels for one hill in each hole. Another advantage of this planter is the fact that the hole, being so large, accommodates kernels of varying sizes. This planter is the best for poorly graded seed; but in our opinion poorly graded seed has no place in good farming.

Cumulative Edge Drop: The edge drop planter is a later invention than the hill drop and is very popular in the Corn Belt, since by using uniformly graded seed it will plant with a greater degree of accuracy than the older style hill drop. This style of planter has a number of smaller holes around the outside edge of the plate. Each hole or slot holds just one grain which is admitted on edge. The plate, revolving almost continually, makes a quarter of one revolution for each hill planted. When the proper number of kernels have been counted out they are checked off by the check wire. Since graded corn varies less in thickness than in any other dimension, it can easily be seen that the edge drop planter should plant graded corn with a higher degree of accuracy than the hill drop planter, or the cumulative drop planter, which take the kernel flat.

We have used several different makes of cumulative edge drop planters on our farms during the last fifteen years. Until recently the weak point seemed to be in the dog which causes the plate to turn exactly one-quarter revolution while the planter is moving from one wire link to another. This defect has been overcome and today an edge drop planter with graded corn, in the hands of an intelligent driver, is almost as dependable as a gang plow.

Kernel Spaced Checking: A new method of planting corn is known as kernel spaced checking. This method requires a special planter which has been gotten out in the last few years. In kernel spaced checking the kernels are placed at the corners of a five-inch square or triangle instead of being bunched, as in other methods. Since each stalk stands singly

as in drilled corn, the advocates of this method claim for it all the advantages of drilling and checking without the disadvantages of either.

For the farmer who plants three or four grains in one hill, kernel spaced checking would perhaps increase the yield, unless there was more of a tendency to sucker than when the kernels were bunched. Since we never plant more than two and three kernels in a hill, we do not think that the advantage to be gained, would justify us in going to the expense of trying out this new method. A government bulletin by C. P. Hartley, entitled "A More Profitable Corn Planting Method," deals with the subject of kernel spaced checking at length.

The chief advantage of planting in hills is that the checking enables the corn to be cross cultivated and kept free from weeds and the entire soil surface kept in good condition without the expensive labor of hoeing. Checking has continued to grow in popularity until today nine-tenths of the corn in the Corn Belt is planted in hills. Experimental work thus far conducted indicates that it makes but little difference, so far as yield is concerned, whether corn is grown in drills or in hills, provided the drilled corn is kept clean. Our own experience has satisfied us that on average corn land checked corn will outyield drilled corn; while on rich blue-grass or alfalfa sod, where as much as three grains would be planted in a hill, if checked, the drilled corn would make a slightly better showing, granting that clean culture be maintained.

Advantages in Planting with a Check Rower

Straight rows and even checking mean better cultivation and larger yields. Crooked rows are usually the result of carelessness or indifference, although the planter is often

PLANTING CORN WITH CHECK ROWER PLANTER AND FURROW OPENERS ATTACHED

The field is being harrowed and rolled ahead of planter. A heavy growth of stalks was turned under in this field

to blame for uneven checking. Uneven checking may be due to several causes. If the wire is too tight the planter checks too soon; if too loose it checks too late. To check true the driver should form the habit of always drawing the wire to a uniform tightness. While the slack should be kept out of the wire the driver should never form the habit of putting the point of the stake in the ground and using it as a lever to tighten the wire. This practice makes the wire too tight for even checking besides causing undue wear on both the wire and planter. If the planter checks too soon the shoes or runners should be pulled back. On all makes of planters with which we are familiar, there is a place on the tongue, (where it is bolted to the planter), to make this adjustment. If the checking is only a trifle "out" it may be corrected by shortening or lengthening the breast straps by which the tongue is raised or lowered.

Disc Furrow Openers

Disc furrow openers consist of small frames and two discs each. The frames are fastened to the shoes of the planter so that the discs are on each side of the runner. The bottom of the discs are from one to two inches above the bottom of the runners, depending on how deep the corn is to be covered. The purpose of these discs is to throw out a furrow from two to five inches in depth. The corn is planted in the bottom of this furrow.

We have used furrow openers on nine-tenths of our planting for over five years, and can say without hesitation that they are a wonderful aid in maintaining clean culture. With the aid of the furrow opener and the high arch surface cultivator, our cornfields are as clean at husking time as they were formerly after the first plowing. The use of the furrow opener gives us a chance to cover all the weeds in the hill

with the first plowing. By plowing with high arch cultivators after the corn is from three to seven feet high, all weeds are killed after the ground is shaded.

Where furrow openers are used, the depth of the furrow is regulated by the lever which raises or lowers the runners, but in order to vary the depth of planting it is necessary to raise or lower the discs on the planter shoes. In our own practice we set the discs to throw out a furrow of sufficient depth to remove all weed sprouts and dry dirt from the furrow. To accomplish this requires a furrow of from two to four inches deep, depending on the dryness of the seed bed. Those who have used furrow openers know that, being a perfect gauge, their use insures a uniform depth of planting.

Although the corn is planted from three to five inches below the surface of the field, it is not covered by much more than an inch of dirt. It is, however, all moist soil, since the dry dirt has all been thrown out by the discs.

Some plant in a very deep furrow, but we do not recommend this, since the sub-surface is often too cold for quick germination. After a hard rain, water may stand in the furrows if they are very deep.

There are some soils and conditions where the use of the furrow openers would not prove practical. On low, wet land where the water level is near the surface, the furrows might stand full of water too long after heavy rains. The use of furrow openers has not proved a success on very hilly land, since the rainfall will gather in the furrows and wash out the seed.

While we have mentioned these objections to the use of furrow openers, the reader should bear in mind the fact that the first plowing fills up the furrow and leaves the ground level.

NOTE: More will be said about furrow openers in the next chapter.

Listing

The process of "Listing" is peculiarly Western, practiced on the big cornfields of Iowa, Kansas and Nebraska, and other corn-growing states west of the Mississippi. In the western part of the Corn Belt, where there is generally a deficiency in rainfall, listing is undoubtedly the best method of planting corn.

From what listing we have seen we must say that we prefer the check rower planter with furrow openers attached for the more humid parts of the Corn Belt, since we believe the seed bed can be better prepared than is possible with listing.

In the April 1st issue (1913) of the Twentieth Century Farmer, there appeared an article by M. A. Coverdell, entitled "Listing, Best Method of Planting Corn." This article is so clear in explaining the process and after culture that it is inserted here in its entirety:

"By listing the land once, letting it stand a week or two, then splitting the ridges and listing again, practically the same porosity of soil will have been established as with stirring and planting by planter, while the crop of weeds that springs up between the two operations will be easier to keep free of these pests through the whole season.

"Lister ridges will dry off and permit of cultivation much quicker than will the flat surface of land planted to corn with a planter. At the same time, the drilled corn in listing, being deposited at a greater depth from the surface than that planted with a planter, it will have a greater supply of available moisture at hand, and thus will resist a drouth better than the shallower planted corn.

"Listed corn is much easier to tend than even check-row corn. A good harrowing should be given just as soon after drilling as possible—before the plants are through the ground if convenient. This enables us to do the job quicker than after the corn is up and has to be watched to prevent covering, and destroys all weed growth, leaving the corn a fair chance to grow, with no weeds to smother it back or sap the moisture from the soil.

"We follow the harrow with a land roller, which crowds considerable fine dirt into the furrow, crushes the clods and leaves the soil in fine condition for future cultivation. While we have secured

good results at this first cultivating with common fenders, better results will be realized if a box about three feet long is allowed to drag between the cultivator shovels for keeping the clods off the corn plants. We use a V-shaped box, which allows the fine, moist dirt to roll in behind it and down against the corn, covering the weeds and nourishing the plant as only such mellow soil can.

"One more cultivation ought to level the furrows and rid the rows of all weeds, leaving the third plowing to hill the corn up slightly. Avoid cultivating too close to the stalks, rather allowing the shovels to run a short distance away and throw the soil against the corn. Where one leaves the ridges too sharp at laying-by, it promotes root growth too far up on the stalks; this ridge washes away a little later, and the tender lower portions of the stalk thus exposed to the heat of the sun, usually so extreme at this season, are literally scorched. This is sure to cut down the yield of the corn. We give the corn a gently sloping hilling-up at laying by, and continue to promote the dust mulch by working between the rows with the five-shovel cultivator, sometimes practicing this even after the corn is in tassel.

"As here shown, it requires considerably less labor to produce corn where the land is listed than if planted by the corn planter, since it can be put in the ground quicker and easier, cultivated with less work and greater ease, and will actually yield more, one year with another. Other advantages that add materially to the excellence of listing are: The roots of the corn are so deeply set in the soil that they brace and hold the stalks in an upright position, thus avoiding the damage so often resulting from planted corn being blown down by the wind; also making a field of listed corn more agreeable to husk in. Then, this same deep-root system leaves less of the stalk above the soil, and so lowers the relative height of the ear from the ground, thus leaving it where it can be easily and quickly reached at husking time. This advantage can be appreciated only after husking the high, unhandy ears in a field that was planted by planter.

"M. A. COVERDELL."

Distance Apart of Planting

The distance between the rows of corn varies from as close as three feet, in the North, to as far apart as six feet in the South. The closeness of the rows in the North is due: first, to the fact that the earlier varieties planted do not grow more than half as tall as do the later maturing varieties grown in the South; secondly, to the fact that it is more difficult to obtain a stand in the extreme northern edge of the Corn Belt, which makes it necessary to plant closer in order to

make up for the greater number of missing hills. In the Southeast, where there is as much as six feet between the rows of corn, it will generally be found that cowpeas are grown between the corn rows. This makes three feet between the row of corn and the adjacent row of peas. It is advisable, in most cases, to have the corn rows at least three feet six inches apart in order to have plenty of room to cultivate. This is especially true where heavy draft horses and riding cultivators are used.

Most of the cornfields in the Corn Belt proper are planted in rows varying from three feet four inches to three feet eight inches in width, and in nearly all cases a three-foot six-inch check wire is used. The majority of Iowa farmers plant three feet six inches both ways. In Central Illinois a large part of the corn is planted three feet six inches in the row with the rows three feet eight inches apart.

Number of Stalks per Hill

There is considerable difference of opinion in regard to the proper number of stalks to the hill. That this difference of opinion should exist is only natural since the proper number of stalks to secure the largest yield is determined by several conditions. The number of stalks for the largest yield will depend on the distance between the rows, the latitude, the variety grown and the richness of the land. One general rule is that where corn is grown for the grain, each plant should have sufficient space to permit its fullest development. This is especially true where the corn is being grown for seed.

The Illinois Experiment Station has carried on extensive experiments to determine what influence the number of kernels per hill has upon the yield. The results are shown in the following tables:

TABLE 1.—SUMMARY OF AVERAGE YIELD FROM ALL FIELDS IN NORTHERN ILLINOIS; MYRTLE, SYCAMORE AND DEKALB

Figures indicate actual yields, bushels per acre

TWO KERNELS PER HILL

Distance between hills, inches	Number of stalks per acre	Myrtle 1904 average	Sycamore 1905 average	DeKalb 1906 average	DeKalb 1907 average	General average 1904, 1905, 1906, 1907
44x44	6480	38.5	37.1	51.6	49.0	44.1
44x39.6	7200	43.6	42.3	52.6	49.8	47.1
39.6x39.6 36x44	8000	44.4	44.1	55.1	51.1	48.7
33x44 36x39.6	8800	47.3	43.2	60.9	52.1	50.9
36x36 33x39.6	9680	45.8	47.1	71.6	52.1	54.2
33x36	10560	46.3	45.8	67.4	57.5	54.3
33x33	11520	48.1	37.2	67.0	55.8	52.0

THREE KERNELS PER HILL

44x44	9720	41.4	43.0	64.5	67.3	54.1
44x39.6	10800	43.3	41.3	70.3	67.8	55.7
39.6x39.6 36x44	12000	45.2	42.1	66.8	72.5	56.7
33x44 36x39.6	13200	45.0	44.7	70.0	71.1	57.7
36x36 33x39.6	14520	43.7	46.1	75.0	70.8	58.9
33x36	15840	45.2	44.3	79.2	71.0	59.9
33x33	17280	43.3	49.5	73.6	77.6	61.0

TABLE 2.—SUMMARY OF AVERAGE YIELDS FROM ALL FIELDS IN CENTRAL ILLINOIS; URBANA, SIBLEY AND MATTOON

Figures indicate actual yields, bushels per acre

TWO KERNELS PER HILL

Distance between hills, inches.	Number of stalks per acre.	Urbana average of 4 years.	Sibley average of 4 years.	Mattoon 1904, 1905.	Gen. average for three fields.
44x44	6480	50.2	45.5	46.9	47.7
44x39.6	7200	51.7	47.9	51.0	50.0
39.6x39.6 36x44	8000	53.8	48.9	54.3	51.9
33x44 36x39.6	8800	54.8	49.7	55.0	52.8
36x36 33x39.6	9680	58.5	49.6	56.4	54.5
33x36	10560	59.6	48.9	57.8	55.0
33x33	11520	54.9	49.9	60.4	54.0

THREE KERNELS PER HILL

44x44	9720	54.1	47.9	53.9	51.6
44x39.6	10800	54.1	47.7	55.7	51.9
39.6x39.6 36x44	12000	53.8	49.0	56.0	52.3
33x44 36x39.6	13200	51.8	48.5	56.6	51.4
36x36 33x39.6	14520	48.6	46.7	54.8	49.1
33x36	15840	49.8	45.5	55.1	49.1
33x33	17280	47.0	42.6	55.0	46.8

TABLE 3.—AVERAGE YIELDS FROM DISTANCE PLOTS IN NORTHERN ILLINOIS ON LAND PRODUCING OVER FIFTY BUSHELS PER ACRE, COMPARED WITH THOSE FROM LAND PRODUCING LESS THAN FIFTY BUSHELS

Distance between hills, inches.	Number of stalks per acre.	More than 50 bushels per acre.	Less than 50 bushels per acre.
TWO KERNELS PER HILL			
44x44	6480	52.8	40.3
44x39.6	7200	54.5	41.7
39.6x39.6 36x44	8000	55.7	41.5
33x44 36x39.6	8800	57.3	41.7
36x36 33x39.6	9680	60.8	43.0
33x36	10560	62.0	41.7
33x33	11520	62.3	40.3
THREE KERNELS PER HILL			
44x44	9720	64.2	39.9
44x39.6	10800	69.4	42.2
39.6x39.6 36x44	12000	69.4	42.9
33x44 36x39.6	13200	67.7	43.9
36x36 33x39.6	14520	68.4	42.2
33x36	15840	70.1	42.6
33x33	17280	70.1	43.3

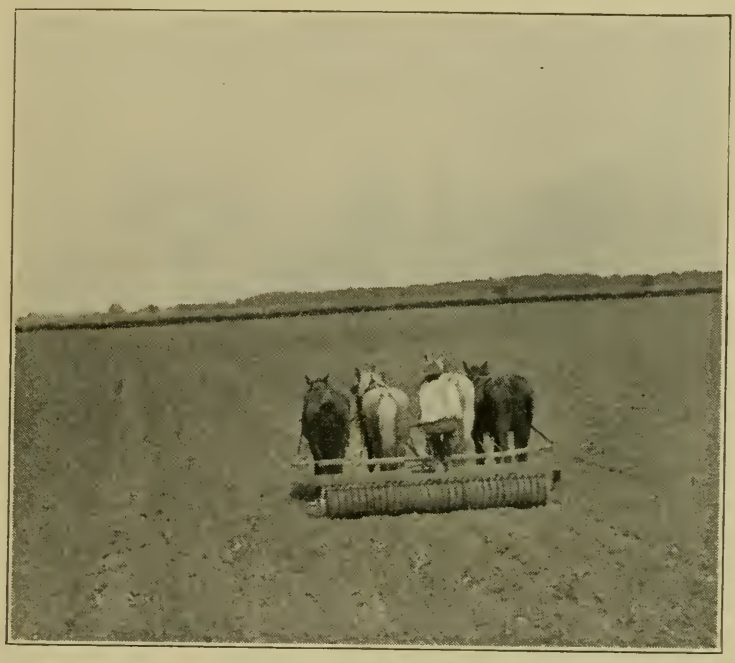
TABLE 4.—AVERAGE YIELDS FROM DISTANCE PLOTS IN CENTRAL ILLINOIS ON LAND PRODUCING OVER FIFTY BUSHELS PER ACRE, COMPARED WITH THOSE FROM LAND PRODUCING LESS THAN FIFTY BUSHELS

Distance between hills, inches	Number of stalks per acre.	Average yield Urbana, Sibley, Mattoon fields.	
		More than 50 bu. per acre.	Less than 50 bu. per acre.
TWO KERNELS PER HILL			
44x44	6480	56.7	42.8
44x39.6	7200	57.5	43.4
39.6x39.6 36x44	8000	58.1	43.5
33x44 36x39.6	8800	59.3	44.3
36x36 33x39.6	9680	62.4	44.2
33x36	10560	64.8	43.1
33x33	11520	63.7	41.2
THREE KERNELS PER HILL			
44x44	9720	61.7	39.7
44x39.6	10800	63.6	41.5
39.6x39.6 36x44	12000	64.1	42.2
33x44 36x39.6	13200	62.3	41.0
36x36 33x39.6	14520	61.9	41.6
33x36	15840	62.0	41.1
33x33	17280	63.8	39.0

NOTE: The above tables are taken from Bulletin No. 126, Illinois Experiment Station. This bulletin is by Albert N. Hume, O. D. Center and Leonard Hegnauer.

The conclusions drawn from these tables show that in all cases but one the rows should be farther apart each way where three kernels are planted per hill and closer together where just two kernels are planted per hill.

The first two tables take into consideration all kinds of soils, while the last two make a comparison between strong land and thin land. They show that the rows should be



ROLLING AND HARROWING CORN JUST AS IT IS COMING THROUGH THE GROUND

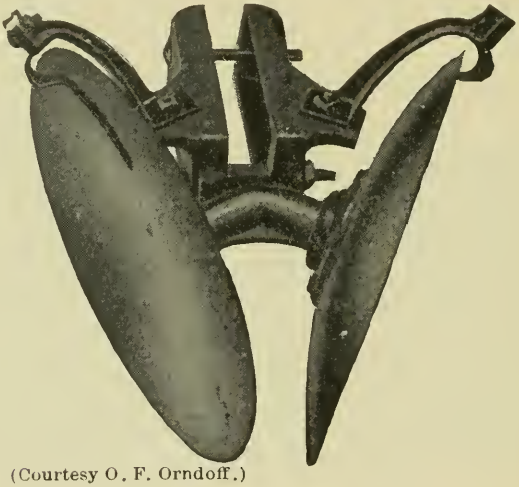
The corn is protected from the harrow teeth by being planted in a furrow

closer on strong land than on thin land, or, keeping the rows the same distance, more kernels can be planted per hill on the stronger land than on thin land.

All of the tables indicate that in Northern Illinois rows may be planted closer and thicker than in Central Illinois.

This, as we have stated before, is due to the smaller, more early maturing varieties grown in Northern Illinois.

For a number of years we have planted in rows three feet six inches apart each way. Of late years we have planted mostly two and three kernels alternately to the hill. In a few instances we have planted three kernels for the earlier varieties. While our primary object in planting only two and three kernels in the hill is to secure the largest number of bushels of fine seed ears, we do not think we have lost anything in total yield. We have grown as much as ninety bushels per acre on strong ground when planting two and three kernels to the hill.



(Courtesy O. F. Orndoff.)

DISC FURROW OPENER

The importance of planting the proper number of kernels to the hill is apparent to every thinking farmer. Since the number is determined by many varying conditions, it will pay every farmer to make experiments along this line on his own farm. By planting in alternate plots two kernels, two and three kernels, and three kernels per hill, every farmer can determine for himself, in the course of two or

three years, just what is the proper amount of corn to plant per acre on his own particular farm.

Replanting Corn

We doubt that it pays to replant corn when the stand is as good as seventy per cent. Before replanting corn, several things should be taken into consideration. The remaining hills, provided clean culture is maintained, will yield correspondingly better because they have more room for fuller development than had the stand been perfect. This partly makes up for the loss sustained by the missing hills. If only the missing hills are replanted they will be shaded by the taller surrounding stalks, which causes the replanted hills to yield little or nothing.

If the stand is so poor the field must be replanted, it is best to single or double disc and replant the whole field with the planter. This plan kills all weeds and usually results in a perfect stand. Never replant corn between the rows of the first planting. This careless method generally results in weedy corn. Before discing up the first planting, determine whether or not a replanted field will have a chance to reach maturity with a normal season. When it is necessary to replant, it is a good plan to plant an early maturing variety if possible.

Like all other corn growers, we have found it necessary at times to replant some fields. In some cases, however, we have replanted and in the fall after making a comparison with a few rows left as a check, we found that the first planting yielded more bushels per acre of sound corn than the last planting. Mistakes like this incur a double loss: First, there is a loss in yield, and secondly, there is loss in time consumed, which is often the greater loss of the two.

CHAPTER IV

CULTIVATION

We are still old-fashioned enough to believe that the chief object in cultivating corn is to destroy and prevent the growth of weeds. A good crop of weeds and a good crop of corn are never grown on the same land. Weeds not only feed on the food the corn should have, but they will pump off the needed moisture in time of drouth and interfere with the economical handling of the crop at harvest.

Next to destroying weeds, the object of cultivation should be to conserve the moisture by stirring the soil at frequent intervals in order to secure a mulch.

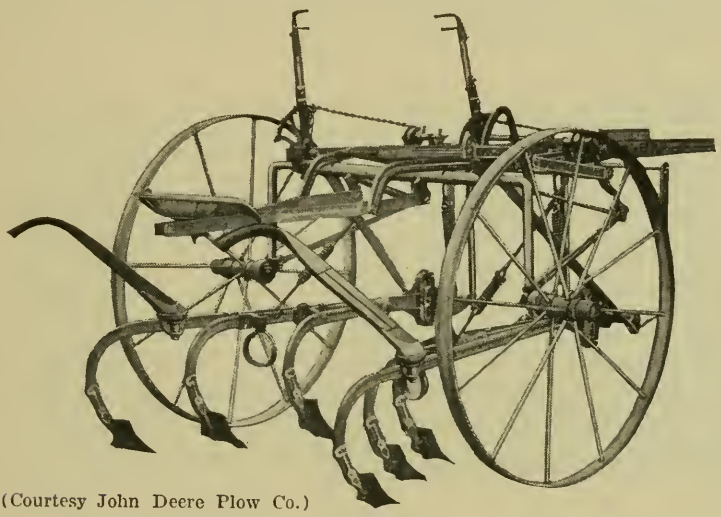
Besides killing weeds and conserving moisture the cultivator should aërate, warm, and loosen the soil to allow the roots to extend into the ground. There are a number of good methods of cultivating corn. Any culture that keeps the fields clean of weeds and at the same time does it without pruning the corn roots may be considered a good method, although perhaps not so economical and efficient as some others.

Harrowing and Rolling

Harrowing corn kills millions of weeds when they are most easily killed,—before they are up. It prevents the formation of a crust and, most important of all, it goes over a larger area in a short space of time. If a hard rain comes before the corn is up we harrow all that we have planted as soon as conditions will permit us to get on the field. We do this harrowing whether we are through planting or not.

The harrows are the heavy type spike harrows and are run with the teeth straight down. We drive the same way the corn is planted. As stated in the previous chapter, furrow openers are used on the planter runners. By using this attachment all the corn plants are in a furrow which protects them from the harrow teeth.

If the field is cloddy, as is sometimes the case in dry seasons, the harrow is preceded by the roller. This pulverizes the clods and prevents the harrow from dragging them into the furrow. The first planted fields are often harrowed twice



(Courtesy John Deere Plow Co.)

COMBINATION RIDING AND WALKING CULTIVATOR

before we have finished planting the last. (See illustrations.) Unless furrow openers have been used we do not advocate harrowing corn after it is up. In some cases the weeder might be an improvement over the harrow in cultivating young corn.

Depth of Cultivation

There is more or less difference of opinion on this particular point. The objections to surface cultivation, when it

extends over the entire cultivating season, are that it has a tendency to pack the soil, and is not as effective as deep culture in destroying weeds. The objection to deep culture, when it extends over the entire season, is that it cuts the corn roots, thereby decreasing the yield. Both of these objections are undoubtedly well made. We have tried surface cultivation (with gopher blades) throughout the three or four cultivations, and have compared it with deeper culture over a like period. With the deeper culture the corn was cleaner and the seed bed was not so packed. Notwithstanding this, some roots were cut by the deeper cultivating which made the surface cultivated fields show about the same yield.

We are thoroughly convinced that any method of cultivation that destroys a portion of the corn roots is disastrous to the corn plant and reduces the yield in proportion to the amount of roots destroyed. Deep culture that prunes the roots after the corn is three feet high may decrease the yield from three to twenty bushels per acre, depending on the amount of rainfall following. If a heavy rainfall comes just after the cutting of the roots, the injury will be slight, but if the pruning process is followed by several weeks of hot, dry weather the injury will be severe. In our efforts to maintain clean culture without pruning the roots, we use shovel plows during the first three cultivations and finish with a fourth plowing, using a high-arch surface cultivator. This plan, of course, is varied somewhat, depending on the season and the foulness of the field.

First Cultivation

We start plowing the first field as soon as we finish planting. If the corn is four or five inches high, six-shovel riding cultivators are used; but if it is smaller than this we prefer

walking shovel plows. Fenders are used for the first plowing and the shovels are run from three to four inches deep. Since the corn is planted in furrows, the dirt always meets around the hills and covers all the small weeds. All the shovels are pointed straight ahead and the field is left level after the first plowing. If the ground has been packed by a beating rain, the harrow precedes the plow the first time over.

By using furrow openers and harrowing the corn once

FIRST CULTIVATION

The corn in this picture is about four inches tall and is being plowed with six-shovel riding cultivator

or twice while it is small, it can readily be seen that the corn will not need to be plowed as small as is sometimes necessary when it is not harrowed. Before trying out the furrow openers we imagined that the first plowing would be more difficult than where the hill was on the level of the field; but we found to our satisfaction that it was much easier to do a good job since it is not necessary to plow so close to the hill in order

to make the dirt meet. The use of the furrow openers helps the corn to withstand a drouth since the root zone is developed deeper in the soil. (See frontispiece.)

Second Cultivation

The field is cross cultivated just as soon as we can get to it, and that is seldom soon enough. The cultivating is done with shovel plows, plowing from three to four inches deep if the corn is small and we are sure that we are not cutting any corn roots. If the corn is ten inches tall, we do not plow more than three inches deep unless the field is foul. It is not necessary to plow as close to the hill the second time over in order to make the dirt meet since the hill is on a level and not on a small ridge as would be the case had furrow openers not been used.

Third Cultivation

If rains have formed a crust on the ground, the third plowing is started just as soon as the last acre has been crossed. We do not like the corn to be more than eighteen inches high when it is plowed the third time. Unless we have a very wet season there are very few weeds to kill when we start on the third cultivation. Since the dirt should meet it is sometimes necessary to turn the shovels slightly inward but we try to throw up as small a ridge as possible. The shovels are run as shallow as is practicable. This plowing is easy and fast teams often average as much as nine acres in one day.

For the third cultivation the corn is plowed the same way it is planted. Our method of plowing corn the first three times is perhaps the most common method used in the Corn Belt, excepting that we seldom stop between the second and third plowings. If the first crop of clover is ready to

be cut before we get over the corn the third time, it will have to wait or rot down and enrich the land. We have never felt that we could afford the price of weedy corn to take care of hay that is worth at least eight dollars per ton to let lay as a fertilizer. We generally have time to put up enough hay for our own use after the third plowing and before wheat harvest sets in.

Fourth Cultivation

We start plowing the fourth time when the corn is between three and four feet tall. We prefer to plow it when it is five feet tall, since the ground is completely shaded by that time. If this plowing is not immediately followed by a rain, the corn will be as free from weeds at husking time as the day it was plowed. Experience has taught us that corn will usually be weedy in the fall if it is laid by early, even though it is perfectly clean when it is laid by. This fact alone should convince any doubtful reader that there is an additional profit to be gained by surface cultivation after the ground is shaded.

To facilitate the plowing of tall corn without breaking it down, we have had several cultivators (gopher plows) built up so as to have a clearance of four feet. We plow the same way with these plows as we do the third time with the shovel plows. (See illustrations.)

These surface cultivators are set so as to plow very shallow. The back of the inside blades are above the surface and serve merely to pull the dirt up to the hill. We have arched neckyokes on the tongues. They are made out of eveners off of old walking cultivators. We have tried crossing the corn a second time for the fourth cultivation, but it was not as satisfactory, since in pulling through the small ridges made by the third plowing, some of the corn roots would be cut. Again, in crossing tall corn a careless driver will sometimes cut off a stalk when they are strung out.

Last year we plowed nearly seventy acres with one of these built up surface plows after the corn had started to tassel out. One field yielded ninety-four bushels to the acre. It was second-sod, having been in corn the previous year.

These plows do better work than mower wheels, or plows made to run between the rows, because they do not cut the roots or bruise the stalks. Any man delights in running one because he is high enough to get the breeze if there is any.

(Courtesy Tower Cultivator Co.)

HIGH ARCH SURFACE CULTIVATOR

Made especially for plowing tall corn

We are not condemning one-horse implements that go between the rows. Anyone is making more than good wages who stirs the ground and conserves the moisture no matter what kind of an implement he uses. On account of this fourth plowing, usually coming during wheat harvest, we generally put the regular hands on the plows and hire extra help to do the wheat and oat shocking.

Land is becoming too high priced in the Corn Belt for

the farmer to be satisfied with three cultivations. Some years three cultivations are sufficient, but more often four or five will pay when corn is worth from fifty to sixty cents per bushel. The practical farmer realizes too well that he can hardly expect to have a loose mulch between his corn rows in August and September unless he works these rows after they are shaded. The great question at this busy season of the year has been to find the time and a method that would not injure the roots or break down the corn.

Our first built-up cultivator has been in use four years. It was raised sixteen inches at a cost of three dollars. The work was done by the local blacksmith. We believe this was the first cultivator made to plow tall corn that straddled the row. Our new cultivators are more satisfactory since they were built up at the factory. There was no additional charge made for this and they can be used as low cultivators. A disc cultivator built up to plow tall corn might be an improvement over the gophers for some sections.

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PART II

BUILDING UP THE LAND

CHAPTER V

The Rotation of Farm Crops

The rotation of crops is one of the best established principles of modern agricultural science; also, one of the most important.

It would seem that the early settlers on the rich virgin prairies of the Central West gave little or no thought to the possibility that the wonderful fertility of the land would ever be exhausted. Crop after crop of corn planted on the same fields for many seasons in succession did not, for a long time, diminish the yield.

After fifteen or twenty years of such cultivation, the lands failed to respond as at first. Yields fell off and lands that formerly produced from sixty to seventy bushels of corn per acre dropped in yields to as low as twenty-five and thirty bushels per acre. Insects began to multiply in alarming numbers and attacked crops. The land also became "corn sick" and in times of drouth, corn fired from lack of moisture.

More progressive farmers began to see that the growing of corn year after year on the same land was a losing game, so short rotations of corn and oats were tried. These rotations, while giving increased yields for a time, were soon found to be lacking since the soil continued to grow less

productive. About thirty years ago clover began to find a place in the Corn Belt rotation. The benefits resulting from growing this legume were very marked, especially when it was grown for the first time. At the present time nine-tenths of the corn land is so deficient in nitrogen and humus, that a rotation containing at least one leguminous crop is not only profitable but necessary.

Today a rotation of crops will be found on all the farms of the Corn Belt. To be sure, this rotation varies from an intelligent, scientific changing about of farm crops, in which the requirements of the soil are always kept in mind, to the haphazard rotations which still prevail on many of the Corn Belt farms.

We are learning facts about our soil today that the eastern states learned to their regret twenty and thirty years ago and even longer, that it is an expensive and tedious process to restore fertility to land after it has been exhausted by the continuous growing of corn year after year. Twenty years hence the wheat belt farmers of the northwest will be confronted with the serious task of restoring worn-out wheat lands. It seems that the older fields of a community must first become so deficient in plant food that it no longer pays to grow the money crop of the country before that community will adopt a rotation of crops that will in any way build up the land. The farmers of this country have been slow to adopt good rotations. They have waited until they were driven to it by necessity. We are, however, optimistic. We feel sure that through intelligent management thousands of farms in Illinois are more fertile today than they were five years ago. On the other hand tens of thousands are becoming less fertile. We believe, though, the time is not far off when the turning point will be reached in Illinois and that farms will gradually become more productive instead of becoming less productive, as they are today.

Higher prices for farm crops have made the building up of worn-out farms very profitable. Better still, higher prices, by increasing the farmer's surplus, are making this restoration possible as well as advantageous for the average farmer. If a farmer realizes that he is farming his land to its ultimate ruin he is still unable to make much of an advance along the line of soil conservation if he has only enough each year upon which to live.

The city man who is complaining about the high cost of foodstuffs should be made to realize that high prices today are giving the farmer an incentive to do better farming and are giving him a working capital with which to build up and improve his farm. The present good prices that the farmer is receiving will do more than anything else toward postponing the day when we may have a serious food shortage.

Getting back to rotation; most farmers agree that continuous corn culture has no place in progressive farming. As a temporary practice on rich virgin soils it may be all right,—perhaps for a few years while the farm is being paid for and some of the comforts are being accumulated about the house; but it a short-sighted policy for any other purpose and is a certain money loser on lands which have been long under cultivation.

Rotation Kills Weeds

Practiced in an intelligent and systematic manner, crop rotation will serve other purposes than the mere up-building of the soil. Chief among these is the possibility of destroying many troublesome weeds, or at least, of reducing presence to the point where they are of little consequence.

Most weeds thrive better with some certain kind of crop. When land is devoted to one crop continuously for a number

of years in succession, the kind of weed, or weeds, that thrive best with that particular crop are given an excellent opportunity to propagate.

There is no better way to check the growth of weeds than to keep the ground occupied constantly with growing farm crops. All observing readers have noticed that bare spots in a field become covered with weeds of some kind.

Many kinds of weeds are kept in check, or are entirely destroyed, by growing some crop like corn which requires open cultivation. On the other hand, many weeds that thrive in open cultivation will be smothered out if the field is put in grass or some small grain. Most rotations make it possible to have a growing crop on the land all the time.

Five years ago we rented eighty acres adjoining one of our farms. Since the farm was not cross fenced and the previous tenants desired to pasture their stalk fields they had not sown any part of it in wheat because the stock in running over it would ruin it. The rotation for over ten years on this farm had been corn three years and oats one year, to the exclusion of all other crops. This, together with careless farming, had caused the fields to become badly infested with cockleburs. These weeds were so thick that they were a continual annoyance to the men and teams while putting in the first crop. We put the whole farm in oats the first year, then in wheat two years straight. The result was that the cockleburs were completely destroyed. In addition to this, the milkweeds, which had gotten a bad start, were also destroyed. While we have only had this farm five years it has been changed by crop rotation and clean culture from one of the foulest to one of the cleanest farms in the county. If we were to follow this system again we would substitute soy beans for most of the oats. One year with another, this is

as good a money crop as oats and has a big advantage over oats since it is building up the land instead of running it down.

Rotation Improves the Physical Condition of the Soil and Increases its Fertility

The roots of the different crops are of great aid in pulverizing (and fining) the soil. When deep rooted legumes are grown in rotation they utilize and bring to the surface plant food which lies beyond the reach of the short rooted cereals. When the roots of these legumes decay this nitrogenous plant food is left in the surface soil to be used by the succeeding grain crops.

While there is a slight improvement in the physical condition of the soil when different grain crops alone are rotated, the greatest benefits of rotations are derived from the legumes included. For this reason at least one leguminous crop should be included in every crop rotation.

The increase in the fertility of the soil as a result of crop rotations is due entirely to the additional nitrogen stored in the soil by the legume. If the leguminous crop is taken off the land each time it is grown it is doubtful if any nitrogen is added. When soy beans and cowpeas are grown and the hay is taken off and no manure is returned it is believed that nitrogen is actually taken from the soil rather than added. If soy beans and cowpeas are grown for the seed, the straw should be returned to the land after the seed has been threshed out. Since a good supply of nitrogen is essential for the profitable growing of grain crops, and the only cheap way to get this nitrogen is by growing legumes, every effort should be made to leave as much of the crop on the land as is possible.

We wish to say, right here, that crop rotation alone will

not permanently maintain the fertility of the soil. All crops require more or less phosphorus and potash as a part of their plant food. Each year a drain is made on the supply of phosphorus and potash. When these elements of plant food are taken from the soil they must be returned in the form of stable manure, commercial fertilizer or rock phosphate. No plant can put phosphorus and potash in the soil; instead, they all take it out.

For nearly fifteen years we have followed with slight variation a rotation consisting of corn two years, then oats, wheat and clover successively. This is the popular rotation in Central Illinois and is followed to a greater or lesser extent on nine-tenths of the farms in this latitude.

Since oats are a heavy drain on the land and often an unprofitable crop, we have, for the last two years, substituted soy beans largely for oats. Each year we sow about 100 acres to soy beans. Before adopting soy beans this ground was sown to oats. By following this method we are including two leguminous crops in the rotation instead of one.

The soy bean is a wonderful crop for improving the physical condition of the soil. An ideal seed bed for winter wheat can be made on soy bean fields with very little work. Remember to return the straw to the land if you wish to increase the nitrogen content of the soil. (More will be said of soy beans in the next chapter.)

Alfalfa is one of the most profitable of the legume crops but it is not a good crop to work in a rotation. This is due to the fact that it is difficult and expensive to secure a good stand and when once secured it is profitable to leave the ground in alfalfa from three to five years. A good stand of alfalfa will generally grow better each year for the first three years. Alfalfa will grow on most of the well drained soils of the Corn Belt. It will grow on thin land but it will do much better on strong land. That alfalfa will build up

the land is shown by the fact that eighty bushels of corn have been grown on alfalfa sod when fifty bushels could not be grown on this land before it had been put in alfalfa.

(We tell of our own experience in growing alfalfa in the next chapter.)

Rotation Kills Insects and Checks Plant Diseases

Rotation not only gives opportunity to improve the physical condition and increase the fertility of the soil, but it may also be made to head off many kinds of insect enemies and plant diseases. If one kind of crop is grown year after year on the same field, its insect enemies are likely to multiply rapidly since they are continually supplied with the particular kind of food upon which they thrive best. Because of the fact that changing cuts off this food supply for a time, intelligent crop rotation has been found more effective than all other methods combined in the economical checking of insect and fungous pests. (In the chapter entitled "Diseases and Insects" we are telling in detail how crop rotation is effectively checking the corn root worm.)

Crop rotation is as effective in checking many of the smuts, rust, and blights as it is in checking the insect pests. Since the annual damages to the crops from insects alone amounts to several millions in each state, too much stress cannot be laid on any method that will check them. Even if crop rotation were not essential to the maintenance of soil fertility it would be necessary to rotate to keep in check the insect pests.

Rotation Distributes Farm Work

Another very important reason for practicing crop rotation is that it distributes farm labor evenly over a long period of time. When a rotation such as corn, oats, wheat and clover

is followed, there will be field work to be done that will require the greater part of the year. Fall plowing for wheat is done during a slack season and with horses and implements that would otherwise be idle if winter wheat was not going to be raised. Two crops are raised with the same farm equipment that would be required to raise either one. This means economy of production. If one farmer can work his teams for only three months in the year while his neighbor, who follows diversified farming, can work his nine months to advantage, then the first farmer's teams cost him three times as much per day as do the teams belonging to his neighbor.

The greatest advantage to be gained by extending farm operations over as long season as possible is due to the fact that labor can be economically employed by the year. Labor which can be employed by the year not only costs less per day but it is of superior quality to labor which is employed by the day or week. Men employed steadily take more interest in their work and are better men. Our own experience has taught us that the most dependable farm hands are married men. For this reason we employ married farm help by the year and furnish them with comfortable houses in which to live. While the first cost of the married man is greater than single help with board furnished, the married man will prove to be cheaper in the end and certainly much more reliable. We plan our crop rotations partly with a view to giving employment throughout the year.

Rotation Lessens the Danger of Crop Loss

While corn is the most certain money crop grown in the Corn Belt, its yield is easily cut down one-half by weather conditions when wheat, oats or legumes might be hurt little if any. Crop rotation and diversified farming make for more

uniform and more certain yearly returns. When corn alone is grown, the farmer depends entirely on the yield and price of his corn for his profit. On land that can grow several crops profitably it is poor business to depend entirely on one crop for a profit and a living.

Rotation Furnishes a Balanced Ration for Live Stock

It is necessary to grow several crops in order to have a balanced ration for live stock. Rotation of grain with leguminous crops gives this balanced ration. Corn is very rich in starch. When it is grown extensively there is a tendency to feed a ration deficient in protein. Since there is a large amount of protein in all the legumes, the ration can be balanced by growing and feeding clover, alfalfa, soy beans, etc. The first one hundred pounds of weight of spring pigs can be produced very cheaply if they have access to good clover or alfalfa pasture. Our principal profit in growing hogs is due to the fact that they are raised on clover and soy bean pasture.

What is the Best Crop Rotation?

This is the question that each farmer will have to solve for himself. Crop rotations should depend upon the size of the farm, the nature of the soil, the market demand for the different crops and the abundance or scarcity of labor.

Again, a rotation that is good for one season may not be the best for another; but notwithstanding all this, every crop rotation should include at least one leguminous crop.

A good five-year rotation, and one that will build up the land is,—corn two years, soy beans one year (or cowpeas),

wheat one year and clover one year. As we have said before, the straw should be returned to the land if the beans are hulled. The clover is often worth more for pasture than it would be if allowed to rot down as a humus and fertilizer. If the clover seed is hulled the straw should of course be returned to the land. If the clover fields are not needed for pasture it is a good plan to cut the first crop early and let it lay to enrich the land. This early cutting of the first crop will often double the yield of seed in the second crop.

Humus

Humus may be defined as decaying vegetable matter. It varies in composition and quantity in different soils. The productive capacity of land is measured largely by its physical conditions and the physical condition depends largely upon the amount of humus and nitrogen in the soil. When old land is packed and breaks up cloddy it is often due to the fact that the humus has been exhausted. While the grain crops are dependent on several elements it is usually the supply of nitrogen which limits the crop production. All the nitrogen used in the growing of corn crops is taken from the humus in the soil, while the legumes get a certain amount from the air.

Since the grain crops are dependent on humus, it can readily be seen that every effort should be made to restore as much humus to the soil as is taken out by the crops and the rapid decay which results from open culture. Vegetable or animal trash of any kind will make humus, although some kinds, like clover hay, and stable manure will make a great deal more than will straw, corn stalks or leaves.

The drouth-resisting qualities of a soil depend largely upon the amount of humus in it.

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"Married Men Cheaper than Single Help." By Ralph M. Ainsworth. *Prairie Farmer.* March 1, 1913.

"The Fertility of the Land." By Isaac Phillips Roberts.

CHAPTER VI

LEGUMINOUS CROPS

Nitrogen is no more essential to the growth of corn than certain other elements but it is the one required in the largest amount and is the most easily lost from the soil. Throughout the Corn Belt it is more often the lack of nitrogen than of any other element which limits crop production. When this supply of nitrogen is low it must be restored before paying grain crops can be grown on the land.

The object in growing leguminous crops is to restore economically the nitrogen which has been used up by the preceding grain crops. Many so-called worn out soils are worn out only in the sense that the humus (decaying vegetable matter) in them has been used up by the grain crops and clean culture which they received. When this nitrogen and humus has been restored by the growing of several leguminous crops, many farms are made as productive as they were when first broken up.

Leguminous crops such as clover, soy beans, cowpeas, vetches, alfalfa, sweet clover, etc., have the power of taking pure nitrogen from the air and storing it in the roots through the nitrogen-fixing bacteria in the root nodules. At the same time it must be remembered that all the nitrogen in the legumes is not stored in the roots but that a considerable part is distributed through the stem and leaves. If, then, hay is removed, all the nitrogen in the stems and leaves is also removed. By removing all the soy bean or cowpea hay it is believed that nitrogen is actually taken from the soil rather than added. It naturally follows that if the nitrogen con-

tent of the soil is to be rapidly increased, it is necessary that the nitrogen in the stem and leaves should be returned by plowing under the crop or, at least, by returning the straw to the land after the seed has been removed.

The legumes we have used in restoring and maintaining a sufficient supply of nitrogen and humus in the soils of our own farms have been clover, soy beans, cowpeas and alfalfa. We have not used vetches or sweet clover but we intend to sow eighty acres of the latter. Our reasons for giving sweet clover a trial will be mentioned under "The Culture of Sweet Clover."

Clover

Clover is the mainstay legume used in restoring nitrogen and humus to over-cropped farms of the Corn Belt. It is well adapted to the black prairie soils of the Corn Belt. It not only adds one more year to the rotation, thus resting the land from corn that much longer, but it actually enriches the soil by adding nitrogen. What is just as important, it makes available large amounts of phosphorus and potash in the soil by the decay of its roots. (The supply of phosphorus and potash in the soil is not increased by growing legumes, but that which is already there is rendered more available by the acidity of the clover.)

In field tests extending over twenty-nine years on the black corn land of central Illinois the experiment station of this State found that at the end of that time corn grown continually on the same land yielded twenty-seven bushels per acre as an average for the last three years of the test. Corn grown in rotation with oats yielded forty-six bushels per acre, while corn grown in rotation with oats and clover yielded fifty-eight bushels per acre without the aid of either fertilizer or manure. (See Bulletin 125, Illinois Agricul-

tural Experiment Station.) These results have been verified on thousands of farms throughout the Corn Belt.

There are three common kinds of clover of general importance to the farmer. They are, in the order of their importance: the common red or June clover, mammoth or sapling clover, and the Swedish or Alsike. The common red is the most extensively grown of these varieties. It will do well on most of the common prairie soils of the Corn Belt. It differs from the other two varieties in that it gives two crops in one season, either two crops of hay or a crop of hay and a crop of seed.

Alsike will do well on any soil that common red clover will thrive on and in addition it will grow on soils that are too wet for the common.

Mammoth clover is distinctly the clover for sandy and other poor soils. It will get along on soils too thin and too dry for either medium or Alsike to thrive on at all. This is the best clover for soiling purposes. If a soil is very sour and lacking in lime, it will not grow the clovers or other legumes until these conditions have been remedied. Two thousand pounds of limestone applied about once in every four years will correct the acidity in most soils and make it, not only possible, but easy to grow clovers and other legumes. The application of limestone to the soils of Southern Illinois has made possible the growing of clover on thousands of acres that were too acid before the application of lime was made. Clover has been grown successfully for years in central and northern Illinois without the application of limestone, although the soil would doubtless be benefited and the clover crop helped by its application.

Culture

We always sow clover in a nurse crop of wheat or oats. This is not only the profitable method, but it is best to have

the nurse crop in order to keep down the weeds until the clover can get a start. We prefer to seed about four quarts of good seed per acre on winter wheat early in March and let the frost work the seed into the ground, or to sow later when the ground can be harrowed, and harrow the wheat immediately after sowing the clover seed. This harrowing will cover the seed and if the ground is not too wet it will benefit the wheat.

If it is desirable to seed the clover with oats, the clover may be seeded at the same time the oats are drilled. When both are sown in one drill it is necessary to have a separate attachment made purposely for seeding the clover. It will not do to mix the clover with the oats since the clover will be covered too deep. Besides, clover seed, being heavy, will shake to the bottom and will not be seeded evenly. In general the sooner the nurse crop is gotten off the clover the better it will be for it.

Other things being equal, we prefer seeding clover with wheat rather than oats since the oats often grow so rank as to shade the clover and kill it.

Clover, to grow well, must have plenty of air, moisture, and warmth. The first two seem to be more important than the last, although young clover is often killed if a warm early spring is followed by severe freezing weather.

Unless clover has made a rank growth the first fall, it is not a good plan to pasture or cut it the first year. Generally speaking, the fall growth after the nurse crop is taken off should be allowed to rot down and protect the roots through the winter.

Soy Beans

Soy beans are one of the most profitable crops that can be grown on the farm. This crop has gained rapidly in pop-

ularity during the last five years. It is almost as efficient a soil builder as clover and is a splendid crop for hay. The seed sells for two and three dollars per bushel and the yield is from eight to twenty bushels per acre. On our own farms we are growing soy beans on the ground that formerly went in oats.

As stated in the chapter on rotation, soy beans will, one year with another, grow as big a money crop as oats besides building up the land instead of running it down. During the

HARVESTING SOY BEANS

last two years, we have grown one hundred and twenty acres of soy beans and just enough oats to feed our horses. The seed was threshed by the ordinary grain separator although a regular pea or bean huller would be more satisfactory. Our yields have averaged about ten bushels per acre and the surplus seed sold at $2.50 and $3.00 per bushel.

When the grain separator is used the concave teeth should all be removed and the speed of the machine reduced to about one-half of that ordinarily used in threshing grain. The tail

of the machine should also be lowered to prevent choking.

Culture: Soy beans should be planted on the poorest land on the farm. If it is possible to do so, it is well to break the ground early and harrow it once, then leave it until after the corn is all planted before working it in to a seed bed and planting the beans. It is not hard to get a good stand if the seed is good and the seed bed is moist and warm. These last two conditions are absolutely essential.

The soy bean is just as susceptible to frost as garden beans. Cold ground will rot the seed and a frost will kill the plant after it is up. From the first to the middle of June is a good time to sow the beans in central Illinois. The soy bean can stand considerable dry weather after the plant has attained the height of four or more inches. The seed should never be planted in dry ground, since it will swell and rot unless the drilling is followed by an early rain. It is better to wait until the rain comes before beginning to drill.

The seed bed should be prepared as for corn and all weeds killed immediately before sowing. We prefer to drill the beans and use an ordinary grain drill. We sow about one and one-half bushels and use all the holes in the drill. If we get a good stand and have favorable weather the field will be free from weeds, since the rank growth will smother them out. Good results have been secured by planting less than half the above amount of seed per acre. We drill thick in order to smother out the weeds. We have never tried drilling in wider rows and cultivating since our time at this season of the year is needed in the cornfields. With a good seed bed, the seed should be planted about three inches deep.

We have grown mostly the "Medium Yellow" but this last year we have tried the "Black Ebony" or "Medium Black" as it is sometimes called. For some reason or other the nitrogen-gathering nodules on the roots are larger than

on the "Medium Yellow." The "Black Ebony" grows more rank and is about two weeks later than the "Medium Yellow."

Inoculation: Like other legumes, soy beans utilize the nitrogen in the air and add it to the soil by means of root nodules. These nodules are caused by certain bacteria. Unless they are present, soy beans in most soils will make but a weak growth; many will turn yellow and some may even die. These bacteria are present in most soils of the South but in the Corn Belt proper, the bacteria are not well distributed, which makes it advisable to inoculate.

Inoculation of a new field may be secured either by transferring the soil from a well inoculated soy bean field or by using some of the pure cultures advertised. (We obtained our first inoculated soil from the Illinois Experiment Station at Urbana. The station sells soil at fifty cents per hundred pounds and one hundred pounds is enough for twenty acres if the glue process is used.)

We find the glue process the most economical as well as the most effective. The method consists of sticking particles of the inoculated soil to the beans by wetting the beans in glue water. The glue water is made by dissolving about three pounds of glue in ten gallons of water. This is enough water to wet fifty bushels of beans. (It is a good plan to add about a gallon of flour paste as this gives the glue water a little body.) A layer of beans about four inches deep is thoroughly wet with the glue water and the inoculated soil is sprinkled over them. The beans are then shoveled about until particles of soil are sticking to all the beans. Then another layer is treated in a like manner. The beans should be shoveled over about every half hour until they are dry. They will be dry enough to prevent heating in two to four hours. Do not try to drill until the beans are dry and don't

expose the beans to the direct rays of the sun after the soil is added. Sunlight will kill the bacteria in the soil.

Cowpeas

Cowpeas and vetches are the main leguminous crops for poor soils. Cowpeas have the power to extract plant food from land that is too poor for the profitable growing of such crops as clover, alfalfa or even soy beans. They will grow without inoculation on new land which is something that most legumes will not do. The bacteria of this legume seem to be present in nearly all soils. While cowpeas will grow on most soils they are better adapted to sandy types than to heavier black soils. In other words, the cowpea will do for light sandy soils what the soy bean does for heavier soils. For this reason we have grown soy beans in preference to cowpeas on our own lands, which are a black retentive loam. The western part of Mason County is quite sandy. On this soil cowpeas grow to perfection and find a place in the crop rotation of all the well regulated farms.

Cowpeas are largely grown in the Cotton States of the South. It is safe to say that no one plant can add more to the agricultural wealth of the South than the more extensive growing of cowpeas. A common practice in the South is to grow cowpeas between the rows of corn, thereby enriching the land and doubling the value of the stalk fields for pasture.

Culture: The seed bed for cowpeas should be prepared in the same manner as for soy beans. While the seed and young plant is more hardy than those of soy beans, good preparation will pay big returns. Cowpeas should be sown late in the North, after all danger of frost is over. It is best to double disc well just before sowing in order to kill all weeds.

If cowpeas are cut for hay, the hay should be left in the cock for a week, and longer if the weather is not very dry. A good plan is to let the hay stay in the windrow a day, before it is put in the cock. Cowpea and soy bean hay dries very slowly, because of the thick stem. For this reason it is unsatisfactory to take the hay direct from the windrow to the mow or stack. The growing of cowpeas or soy beans on land is a good preparation for the growing of alfalfa.

Vetches

Vetch has a very important place in the building up and renovating of the depleted soils of the East and Southeast. It often paves the way for successful alfalfa growing on soils that are too poor to grow alfalfa at the start. Vetch is not much grown on the black prairie soils of the Corn Belt. It is our opinion that other legumes are more effective than this annual in maintaining the productivity of prairie soils.

Culture: Vetch may be sown either broadcast or by drilling. Drilling is the more modern method. It may be sown alone or with one of the small grains as a supporting crop. In the Southern states a winter vetch is sown in the fall, either in September or October. Hairy vetch is the favorite in the North. In the spring it may be sown as early as the ground can be gotten in shape. The seed is sown at the rate of one bushel per acre. It is necessary to inoculate some soils in order to grow vetch successfully.

Alfalfa

Alfalfa is fast becoming a popular crop in the Corn Belt. Its splendid hay qualities are rapidly pushing it into public favor. We took a great deal of pains to put in eight acres of alfalfa and later results showed that it deserved all the attention it received. From this eight acre field we cut three

crops of hay the following year. The three crops yielded better than five tons per acre.

The hay is of the finest quality and will usually sell for eighteen dollars per ton, or ninety dollars per acre; but it is not for sale at this price. We feed it to our own stock. After obtaining these results on eight acres we felt justified in sowing twenty acres more the following fall. (The two following photographs were taken in this eight-acre field the summer after the crop was put in.) This was our first attempt at growing alfalfa. We were careful in the prepa-

ALFALFA HAY IN THE COCK. THE COCKS ARE COVERED WITH CANVAS CAPS

ration of the seed bed and followed instructions in regard to seeding and inoculation.

We want to say right here, however, that if alfalfa is grown at all it should be grown as a money crop. If it will not average two tons of good hay per acre it is better, in our opinion, to grow some other crop. Alfalfa is an expensive crop to put in, when it is put in right and one cannot afford to put it in any other way.

The ground on which alfalfa is grown should lay fallow

and should be worked at frequent intervals the first summer. This means no returns the first year. Again, alfalfa can not be made a paying crop on poor, unproductive soils. Alfalfa ground must be sweet and in good physical condition if the returns from the crop are to justify the necessary expense. Most of the black prairie soils of the Corn Belt can be made good alfalfa land by the application of limestone to the soil.

Alfalfa should be made a money crop rather than used

BALING ALFALFA HAY ON CLOVERDALE FARM
This field made over five tons of hay per acre, the year after it was sown

as a soil-building legume. If alfalfa is grown it is grown for the hay and large quantities of phosphorus and potassium are removed from the soil in the hay. On the other hand some nitrogen is stored in the roots and the physical condition of the soil is undoubtedly improved. In actual practice, then, alfalfa improves good land but cannot be considered in connection with poor land, as it is not a profitable crop to grow on unfertile soils.

Soils: An ideal alfalfa soil is a deep rich sandy or clay loam. Alfalfa will not thrive in a sour soil. Alfalfa bacteria can not live in an acid soil and these bacteria are absolutely necessary to the successful growing of the crop. The application of two thousand pounds of limestone will "sweeten" acid soils for the growing of alfalfa and all farm crops. If the soil is only slightly acid, less lime will be necessary. We have not found it necessary to use limestone on our soils.

If the land is very flat, it should be well drained before seeding to alfalfa. Superfluous water will drown out alfalfa. The soil must be full of air spaces and if these are filled with water the alfalfa will smother and turn yellow.

Inoculation: Alfalfa bacteria are seldom found in the soil east of the Mississippi. These bacteria must be artificially supplied before alfalfa can be profitably grown. Since sweet clover bacteria and alfalfa bacteria are identical, soil from the roadside, where sweet clover is growing, will serve to inoculate the alfalfa field. We use a manure spreader to scatter inoculated soil, although it can be done very well by hand. If sweet clover soil is not available, "pure alfalfa culture" can be obtained from reliable seedmen. This alfalfa culture is satisfactory though rather expensive.

Preparation of Seed Bed: As before stated, the ground should be plowed deep, preferably in June. The ground should then be disced or harrowed every week or two, (in order to kill all weeds), until about the first or middle of August, when it should be worked repeatedly until a very fine mellow seed bed is secured. The field should then be inoculated as suggested above and clean seed, free from weed and other seeds, should be sown at the rate of fifteen pounds to the acre.

The seed bed must be moist from the very top surface down. We sow broadcast with a horn seeder and sow both ways to insure an even distribution. The seed should be

covered to a depth of one-half to one inch by a light harrowing.

We have never sown alfalfa seed with a nurse crop and are inclined to believe the results would be unsatisfactory. If the seed was sown in the spring it would, of course, be necessary to use a nurse crop of some kind to keep down weeds until the alfalfa could get a start; but spring sowing of alfalfa has not been so successful as fall sowing in Illinois and Iowa.

Alfalfa should be cut when from one-third to one-half the blooms are out, or just after the new shoots have come out at the base. It should never be cut until after the new shoots have started. To cut before means a very weak succeeding crop. If there is a considerable growth in the fall it should be either pastured or clipped before winter comes on. A light application of manure (with a manure spreader), in December will prevent alfalfa from being winter killed. Remember alfalfa, like corn, is a good money crop if it is properly put in on good fertile soil. Unlike clover, beans and peas, it is not a rotation crop. If a good stand of alfalfa is secured it will pay to leave it for four or five years.

Sweet Clover

Sweet clover is a deep rooted legume, and is found growing along the roadsides everywhere. No other legume has such a wide range of territory, nor will any other legume grow in as many types of soil or under such varied conditions. Because of its hardy nature and wonderful adaptability it is considered by most farmers as a weed. It has been only in the last two years that farmers have taken kindly to sweet clover. The majority are still skeptical. Many admit that it is a good nitrogen gatherer but are afraid to give it a place on their farms for fear it will, as they say, "take the farm."

It has been proved, to our own satisfaction at least, that sweet clover will never be a troublesome weed on our farms. Stock will not allow it to start in the pasture and it is as easily killed as clover in a cultivated field.

We are so impressed with the merits of sweet clover that we shall seed eighty acres to this legume in the spring. The seed will be sown with a nurse crop, either wheat or oats.

Sweet clover, unlike alfalfa, grows so rank and hardy from the start that it can be sown in the spring without a nurse crop and still keep ahead of the weeds. By sowing sweet clover in the spring with a nurse crop of wheat or oats, however, the land will bring returns the first year, which is not the case with fall sowing of alfalfa.

Judge Quarten in an article entitled "Sweet Clover" by Alson Secor says: "I seed with Early Champion oats, using a bushel or a bushel and a half, to eighteen or twenty pounds of sweet clover seed. Cut the clover the latter part of September in northern Iowa. If I use barley, one bushel is enough."

"Don't you ever seed it alone?"

"Haven't worked that out yet. I believe it would pay to throw some seed in the cornfield at last cultivation. Will try that. But I prefer to use a nurse crop to keep down weeds."

We believe that sweet clover will, in the future, become the greatest legume crop for the building up of worn out farms. It is the best crop to pave the way for the growing of alfalfa.

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CHAPTER VII

STABLE AND BARNYARD MANURE

Stable manures are the oldest, as well as the most common, materials used for enriching the land. On practically all of the farms in the United States a greater or less amount of the manure produced on the farm is returned to the land. However, the amount returned compared with the amount produced varies greatly on different farms.

On farms where the true value of stable manure is fully appreciated it will generally be found carefully preserved in covered manure pens from which it is frequently applied to the fields by means of manure spreaders. On other farms where slip-shod and bonanza methods are still the rule it is usual to see steaming piles of uncovered manure waiting for months until its value is half gone (through leaching), before being finally hauled out and applied to the land. As the farm lands of this country are becoming more depleted, stable manures are being made better use of and the number of farmers who deliberately allow manure to rot with no intention of ever applying it to the land are fortunately becoming very few.

When farm land becomes so worn that it is necessary to apply commercial fertilizers in order to grow paying crops, every farmer is seriously made to realize the true value of stable and barnyard manure. It is a well known fact that on thin Eastern farms, where the applications of commercial fertilizers are a yearly occurrence, stable manure is well cared for and but little is lost or wasted. Stable manure that is produced on the farm can be applied to the land

at less than a tenth of the total cost of purchasing, hauling and applying commercial fertilizers of equal fertilizing value. We consider stable manure second in value only to leguminous crops for maintaining and increasing the productivity of the farms of the United States.

Stable manure that can be applied to the land is, in our opinion, worth more to the Corn Belt farmer than the profit gained by the application of any of the commercial fertilizers. We have used raw bone meal to some slight advantage and the application of several car-loads of rock phosphate has increased the yield and improved the quality of our farm crops sufficiently to justify the expenditure. Notwithstanding this, we have made a thousand dollars by the profitable purchase of stable manure where we have made one hundred dollars by using mineral fertilizers.

Value of Stable Manure

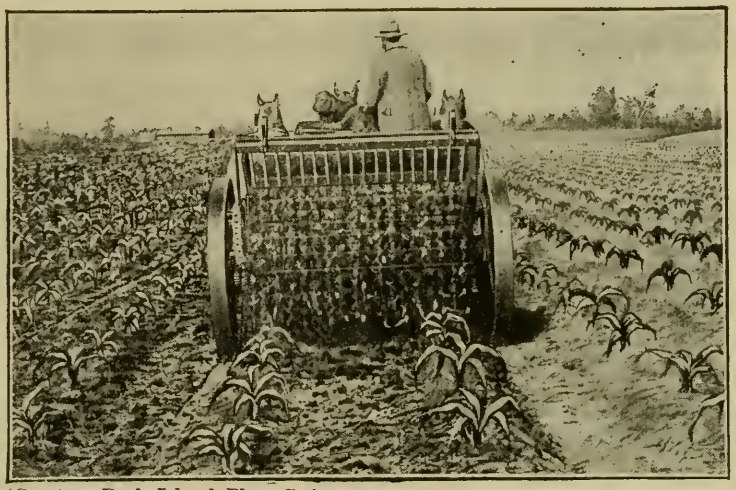
Stable and barnyard manures are without doubt the most variable in chemical composition of any of the manures and fertilizers used for enriching the land. A ton of pure excrement from mature stock fed largely on nitrogenous feeds, such as clover and alfalfa, might easily be worth as much as five tons of coarse, strawy manure from poorly fed stock. For this reason it is impossible to determine the value of a ton of manure until after it has been analyzed.

Besides adding humus and thus improving the physical condition of the soil, stable manure contains, to a greater or less extent, such plant foods as nitrogen, phosphate and potassium. These elements are essential to all plant growth and are deficient in most soils of the Corn Belt. A ton of good stable manure contains about ten pounds of nitrogen, five pounds of phosphoric acid and ten pounds of potash. If these elements were to be obtained from the commercial fertilizers on the very best terms they would cost $2.65 per

ton. This is on the basis of nitrogen at eighteen cents a pound, phosphoric acid at four cents a pound and potash at four and one-half cents a pound.

While these elements are not as available for plant food in stable manures as in some commercial fertilizers, we believe this is more than made up by the value of the additional organic matter present.

On the basis of plant food elements contained, good stable manure is worth $2.65 per ton after it is applied to the land.



(Courtesy Rock Island Plow Co.)

MANURE SPREADER IN OPERATION

The lowest figures we have at hand value stable manure at $1.80 per ton, while the Ohio Experiment Station claims that crops are increased from $3.00 to $4.00 for each ton applied. When used as a top dressing on clover fields, we value manure at $3.00 per ton, at least.

Manure from Stockyards and City Stables

Manure is worth a great deal more after it is applied to the land than before it is hauled from the city stables or railway station. Where manure is purchased in nearby towns

and hauled to the farm it should be bought at prices low enough to enable the farmer to make good wages for his trouble in hauling, aside from its value in building up the land.

In most parts of the Corn Belt proper, manure from city stock yards can be purchased for as low as $1.00 per ton, freight prepaid to the farmer's nearest station. If the manure is of fair quality and as many as four loads can be hauled per man and team in one day we consider it a good purchase with corn selling at sixty cents per bushel. Where wood shavings are used for bedding and the manure is of poor quality, it is doubtful whether it would pay to handle it at the above price.

The best and cheapest manure is usually that obtained in the small towns of the Corn Belt. For several years past we have hauled annually, from eight hundred to one thousand tons of manure from the town of Mason City. We haul from one to two tons at a load and give in exchange straw for bedding. A considerable part of our land joins Mason City on the south so that the hauls are short. One man with a one hundred and twenty bushel spreader averages from six to eight tons per day, depending on the roads and condition of manure. We fully realize that in getting manure at the above prices we are taking advantage of an opportunity that does not lie at every farmer's door. Mason City is surrounded by a very fertile country and for this reason the manure is not appreciated locally like it will be twenty years hence. The town customers who supply us with this manure seem to care less for the straw they receive for bedding than the fact that we call regularly for the manure. If any farmer wants a dependable supply of manure from town stables it is necessary to be prepared to haul at all seasons of the year when the roads will permit. No longer than ten years ago it was necessary to inforce town ordi-

nances in order to get stable litter removed from the alleys of this town before it became a nuisance to public health.

When it comes to appreciating the value of stable manure, the eastern farmer has shown himself more aggressive than the Corn Belt farmer. In New England manure has had a market value for several generations past. The fact that the eastern farmer finds it necessary to manure his land while some of the western farms are fertile enough to grow a crop without manure is no excuse for the Corn Belt farmer. While it is still possible for us to grow a crop without first applying manures or fertilizers it is also true that a ton of manure applied to the black prairie land of Illinois will increase the yield of corn, wheat and oats more bushels than would be the case if the manure were applied to thin, hilly land. With farm crops bringing the present good prices we can surely afford to be as careful in saving and as painstaking in applying manures as can our eastern brothers. The New England farmer has been driven by necessity to increase the fertility of his soil. In fact, much of the secret of every eastern farmer's success is to save all the manure and return it to the soil. Many of us in the West are still living off the fat of the land and some of us will continue to mine our soils until the fertility is completely exhausted.

How Should Manure be Applied?

Every Corn Belt farmer who is farming as much as one hundred and sixty acres can afford to own a manure spreader. The spreader distributes the manure more evenly and over a larger area than is possible when applied by hand. We believe that two tons applied with a spreader will go as far as three tons applied in any other manner. If the farm produces only one hundred tons of stable manure in a year and it is made to go as far as one hundred and fifty tons applied by hand, there has been a saving of fifty tons of

manure. If this is worth only $1.50 per load the spreader has resulted in a saving of $75.00 per year on manure. In addition to this there will be a saving of fully $25.00 in labor. A spreader that is kept oiled when in use and shedded when not should last from ten to fifteen years. The average life of our own spreaders is from eight to ten years, but in hauling manure from town they are subjected to harder usage than would be the case if used only on the farm.

Making Best Use of Manure

A good time to spread manure is on clover sod just before planting corn, but a better time is to apply the manure to the clover plants the fall before. This causes a decided increase in the growth of the clover and if the last crop is turned under the additional growth will be of greater benefit to the succeeding corn crops than would be the case if the manure was applied direct to the corn. Again, manure can be spread on clover fields in wet weather when the team and wagon would pack and injure plowed ground.

For several years we practiced the top dressing of wheat after the ground became frozen, but now we are convinced that manure is worth more when applied to clover or pasture land.

The greatest objection that we have to manure is that it does not go far enough and this is the strongest reason for carefully preserving and applying all that is produced on the farm. It may be necessary, in time, for the Corn Belt farmer to use commercial fertilizers, but the longer he can hold this day off the better it will be for him.

By carefully returning to the soils all the manures, corn stalks and other trash and in some cases applying rock phosphate or limestone, the prairie farmer, with the help of frequent leguminous crops, should be able to maintain the productivity of his land indefinitely.

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CHAPTER VIII

PHOSPHORUS AND LIMESTONE

The three most important elements in the soil are nitrogen, phosphorus and potassium. Of these three soil elements, nitrogen is required in the largest amount. While nitrogen is no more essential to the growth of corn than the other two, it is the element most easily lost from the soil. As we have stated under "Leguminous Crops," nitrogen can be gathered from the air and stored in the soil by the growing of such crops as clover, cowpeas and soy beans.

For this reason the growing of clover for the first time on over-cropped corn land often makes the soil very productive for years to come because the supply of phosphorus and potassium has not yet become lowered. But the supply of phosphorus, like that of nitrogen, can become so low that farm crops (especially clover) will not do well until enough phosphorus has been replaced to bring the supply back to normal.

On many soils in the Corn Belt the crop yield is limited by the lack of phosphorus rather than by the lack of nitrogen. Now, the only way by which phosphorus can be added to the soil is to buy it in some form or other and apply it to the land. If the phosphorus content of the soil is actually lower than the nitrogen content, there is no doubt but that the application of phosphorus would be a profitable investment; but to apply phosphorus to soil that is already very low in humus and nitrogen is nothing less than throwing money away. If clover crops grow large and luxuriant on

a soil, it is safe to say that the soil is not greatly deficient in phosphorus, although a 1,000 pound application might still be a profitable investment. At any rate, it can never do any harm.

How to Buy Phosphorus

Phosphorus can be purchased in the form of bone meal, acid cut rock phosphate, and raw rock phosphate. The results of various experiments made at the Illinois Agricultural Experiment Station at Urbana, prove conclusively that the most economical method of increasing the phosphorus content of the soil is by the application of finely ground rock phosphate with stable manure, preferably spread on clover land.

A good grade of rock phosphate should contain from ten to twelve per cent of phosphorus. Since the phosphorus is the only part of the rock that is of value to the soil, it should be purchased on the basis of the phosphorus it contains. The phosphorus is chemically locked up in the rock and requires the action of some acid to liberate it and make it available for plant use. For this reason it is best to apply it with manure on clover fields.

The acids in the manure and clover plant will set free the phosphorus much more quickly than when applied to some grain crop. The rock phosphate should be ground fine enough so that at least 90 per cent of it will pass through a one-hundred mesh screen. The finer it is ground the more quickly it will be acted on by the acids in the soil.

Application

A good time to apply rock phosphate is in the fall. If as much as twelve tons are needed, it is well to purchase it in bulk by the carload. By getting a minimum carload, it is much cheaper than buying in bags. A good method of

spreading, one that we have followed, is to fill the manure spreader about half full of manure, then spread on a layer of phosphate an inch or two in depth, then fill up the spreader with manure. It is very liable to blow away, and the manure on top prevents this. We have a drill that we have used to some extent, made especially for applying phosphate, but we prefer to apply with the manure spreader, provided we have the manure.

Results

The results of experiments, covering a period of five years, on the King farm northeast of Springfield, show that phosphate treated plots yielded an average of seventeen and six-tenths bushels more of corn per acre than untreated plots. The increase in the yield of oats and wheat was also proportionately greater. The Illinois Agricultural Experiment Station at Urbana has obtained equally good results. On the other hand, we want to be candid with our readers and state that our own results with phosphate have not been so favorable. We believe that one thousand pounds per acre applied on forty acres will eventually pay for itself in increased yields. In addition to increasing the yields somewhat, phosphorus has caused the corn to mature earlier and has made it more sound than that grown on the untreated fields. These last results, rather than the small increase in yields, have convinced us that we have profited by the application of phosphate. We expect to use more in the future.

LIMESTONE

The object of applying limestone is to neutralize the acidity of the soil. Limestone is not a plant food. If soil is acid, bacteria storing legumes will not thrive. Without

these bacteria, it is impossible for clover, soy beans, cowpeas, etc., to secure nitrogen from the air. If soil is very acid (sour), legumes can not be grown until it has first been sweetened by the application of limestone. Thousands of acres of land in southern Illinois are now growing clover where it was once thought such crops could not be grown. In these cases, clover crops were made possible by the application of limestone.

To determine the acidity of soil, place blue litmus paper between two layers of soil to be tested. If the paper turns red in a few minutes the soil may be considered acid and the application of from one to three tons per acre would probably be a very profitable investment. Ground limestone costs from one to three dollars per ton, delivered at most Illinois points. This difference in price is due largely to the difference in freight charges. (The state penitentiary at Chester is the source of a considerable supply of crushed limestone.)

Our soil is only very slightly acid. For this reason we have never used any limestone on our own farms. However, we intend to apply it to our alfalfa fields next year.

Potassium

So far, we have said nothing about the plant food element, potassium, for the reason that the common prairie soils contain enough of this element to last for generations to come. On the other hand, bottom lands, subject to overflow, already show a shortage of potassium. Potassium is usually supplied by applying muriate of potash. When muriate of potash is applied to land that is not deficient in potassium it acts as a crop stimulant rather than as a soil builder. Germany is the principal source of potash.

Additional Reading

"Phosphorus Results." By O. S. Fisher. *Illinois State Register.* September 20, 1913.

"The Salvation of Our Soil." By B. E. Powell. *Successful Farming.* February, 1913.

"Frank Mann's Soil Book." By Frank I. Mann. (Mr. Mann is a practical farmer actively engaged in farming.)

"Results of Scientific Soil Treatment." By Mann and Hopkins. Ill. Agri. Ex. Sta., Bulletin 149.

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PART III

THE SEED

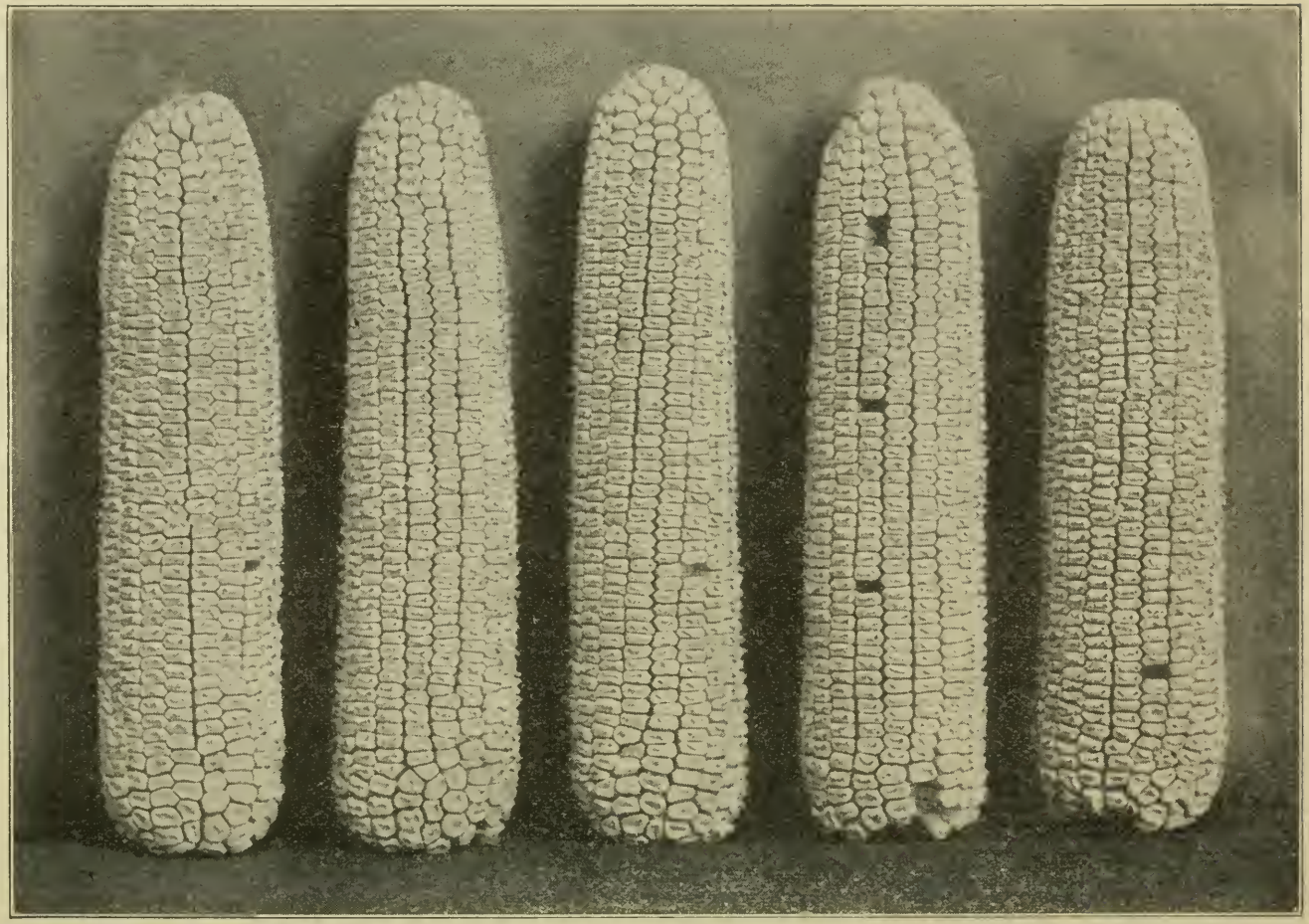
CHAPTER IX

SELECTING THE BEST EARS FOR SEED

In selecting the best ears of corn, whether for display or general field planting, the object should be to choose those ears which will yield the greatest number of bushels of sound corn per acre. Of course, if one is selecting a ten-ear sample to display at some corn show or fair, one can afford to pay more attention to the fancy points of each individual ear than would be the case in selecting several bushels for general planting. Remember that depth of kernel, vitality, and maturity count for more in yield than do fancy tips and butts. A sample containing a few ears having shallow kernels and showing lack of maturity will never take a ribbon in a contest where there is much competition, no matter how near perfect the other qualities may be.

Field Selection

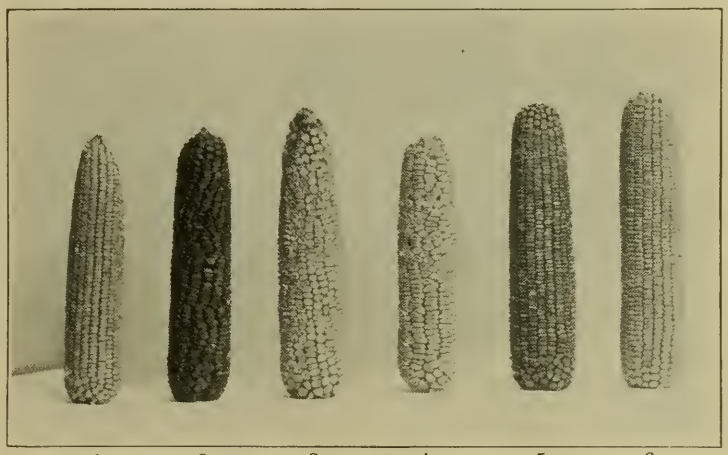
If seed corn is desired for a breeding or seed plot, it is a good plan to select it from the field after the first or second frost. In this way, the corn plant, as well as the ear, can be studied; but do not be in too much of a hurry. The natural place for corn to ripen is in the field and ears selected before they are properly ripened will have a tendency to become chaffy after they are dried. An ear that has matured well in the field will show a strong germ and will



FIVE TYPICAL EARS OF SILVERMINE

grow quickly in the spring providing the germ has not been injured by hard freezing weather.

In selecting seed corn from the field, choose only those ears showing the same degree of maturity. Select all early or all medium ears, depending on your requirements. The earliest maturing ears from a field will average smaller in size than ears of medium maturity. We believe that most of the corn grown in the corn belt matures too late to produce the greatest number of bushels of sound corn. (All elevators, at present, grade corn on the basis of the moisture

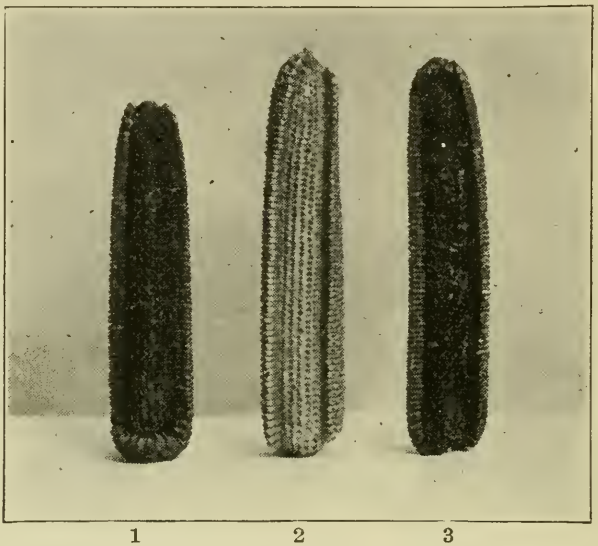


VARIATION IN SIZE OF KERNELS

Since it is impossible to so adjust the planter as to drop these different sized kernels with uniformity, all ears like the four on the left should be discarded. Ear 1 is uniform, but the kernels are too small. Ears 5 and 6 have uniform kernels of the proper size.

it contains.) On the other hand, the period of maturity cannot be shortened to any great extent without reducing the average weight of the ears. In view of these two facts, we are firmly convinced that the best corn for general purposes is that which will utilize practically the entire growing season, and mature safely before it is damaged by freezing. Maturity is determined by the dryness of the stalk leaves and by the firmness of the ears and grain.

Ears should be taken only from those plants that are grown under normal conditions, no matter how vigorous the individual plant. Choose erect, strong, healthy plants. Select ears of a desirable height on the stalk. They should be neither too high or too low. We prefer ears of a height of



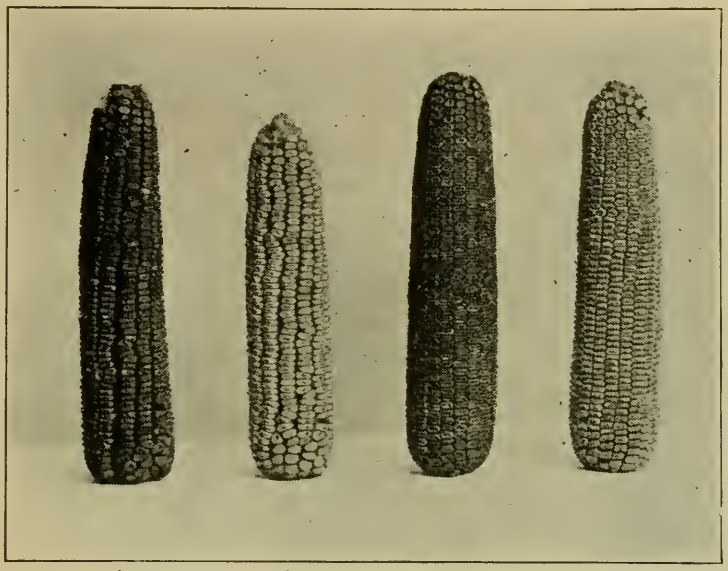
PLUMPNESS OF KERNELS AT GERM END

Ears (see ear No. 1) with too much space between kernels at cob should not be used for seed purposes. Ears Nos. 2 and 3 are desirable

about three feet. There is a marked hereditary tendency in the height of the ears on the stalks which makes it possible, through selection, to have very tall stalks with the ears nearly touching the ground. This, however, is undoubtedly an undesirable extreme. We are strongly of the opinion that the height of the ear on the stalk should be in proportion to the height of the stalk. Johnson, or Boone County White, corn produces a very tall stalk in this latitude and unless bred low more ears will be above four feet than under that height. Four feet is not an undesirable height for so heavy a stalk.

In field selection, soundness and depth of kernel are

determined roughly by the weight of the ear. Determine in advance what type is desired and then select ears which conform to that type. Before selecting an ear, examine it by pulling back the husk on one side. If it is not desirable it can be left with little damage to the ear. Unless



1 2 3 4

SPACE BETWEEN THE ROWS

In ears Nos. 1 and 2 there is too much space between the rows. In ear No. 3 there is not enough space to enable the ear to dry properly. No. 4 shows the proper amount of space between the rows

field, selection is undertaken in a thorough and painstaking manner, the effort is often wasted.

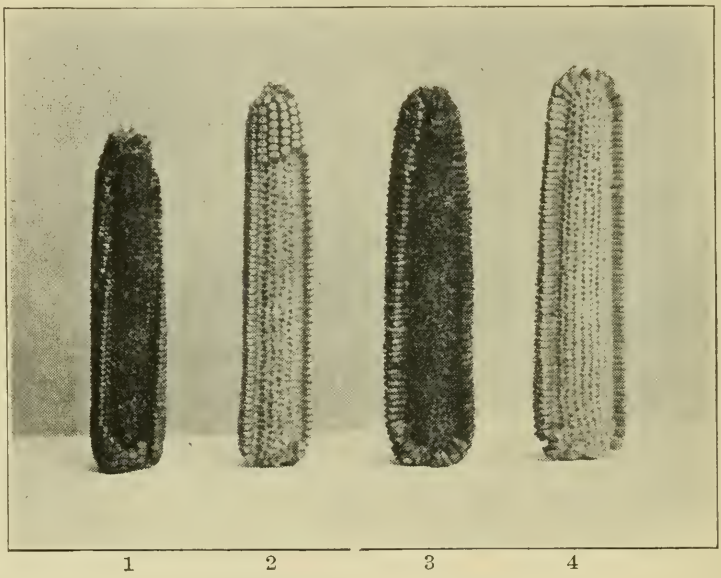
Re-sorting the Corn

If corn is selected in the field, it is a good plan to gather two or three times as much as will be needed so that it can be carefully culled after it is thoroughly dry. Many undesirable points are often seen in corn after it is dry that can not be detected in the field. In order to make the comparison of ears as easy as possible, they should be placed on a table. After all ears that show marked inferiority have been

discarded, the remaining ears should be placed side by side and at least two kernels removed from the middle of each and placed above the ear for comparison. From now on we can more easily study the different points by using the corn score card.

The Corn Score Card

The score card is necessarily arbitrary and inflexible, and should not be followed too closely in the final judging and



DEPTH OF KERNELS

In ears No. 1 and 2 the kernels are too shallow and the percentage of cob to ear is too great. Ears Nos. 3 and 4 show deep wedge-shaped kernels and will shell out a high percentage of corn

comparison of samples. Nevertheless, it is the best aid the beginner has for determining the relative values and different points of merit in different samples. The corn growers' associations in the different states have all adopted some form of score card to be used in the work of corn judging at their annual short courses held at the state agricultural colleges.

The following table is the revised score card as adopted by the Illinois Corn Growers' Association, January 25, 1911:

MEASUREMENT OF VARIETIES

NORTHERN DISTRICT OF STATE	Minimum Length	Minimum Circumference	Per cent of grain on cob
Reid's Yellow Dent	8.5 in.	6. 5 in.	88
Leaming	8.5 in.	6. 5 in.	88
Boone or Johnson County White	8.5 in.	6. 5 in.	88
Riley's Favorite	8.5 in.	6. 5 in.	90
Golden Eagle	8.5 in.	6.75 in.	90
Silver Mine	8.5 in.	6. 5 in.	90
Champion White Pearl	8 in.	6. 5 in.	85
General Classes	8.5 in.	6. 5 in.	88
CENTRAL AND SOUTHERN DISTRICTS OF STATE			
Reid's Yellow Dent	9.5 in.	6.75 in.	88
Leaming	9.5 in.	6.75 in.	88
Boone or Johnson County White	9.5 in.	6.75 in.	88
Riley's Favorite	9 in.	6.75 in.	90
Golden Eagle	9 in.	7 in.	90
Silver Mine	9 in.	6.75 in.	90
Champion White Pearl	8 in.	6.75 in.	85
General Classes	9.5 in.	6.75 in.	88

THE CORN SCORE CARD

POINTS	Perfect Score	Score of Sample
1. Length of ear	10	.....
2. Circumference of ear	5	.....
3. Color in grain and cob	10	.....
4. Shape of ear	10	.....
5. Uniformity of exhibit	5	.....
6. Tips of ears	5	.....
7. Butts of ears	5	.....
8. Kernel uniformity	5	.....
9. Kernel shape	5	.....
10. Space between rows	5	.....
11. Space between kernels at cob	5	.....
12. Vitality or seed condition	10	.....
13. Trueness to type	10	.....
14. Proportion of shell corn to ear	10	.....
Perfect score	100	.....

Explanation of Points in the Score Card

1. Length of Ears: The minimum length of the ear depends on the variety under consideration; thus, the minimum length of Reid's Yellow Dent in the Central Illinois Division is 9.5 inches, Golden Eagle is 9 inches and White Pearl is 8 inches. The deficiencies in length of all ears (in a ten-ear sample) are added together, for every inch thus resulting a cut of two points is made. The length is measured from the butt to the extreme tip.

2. Circumference of Ears: The minimum circumference, like the length, varies with the variety measurement. The deficiencies in circumference of all ears (in a ten-ear sample) are added together, and for every inch thus resulting a cut of two points is made. The circumference is measured at about one-third the distance from the butt to the tip of the ear.

3. Color: In judging color, a red cob in white corn or a white cob in yellow corn is cut ten points. For one mixed kernel, a cut of one-fifth of a point is made; for two, two-fifths of a point, and so on up to five or more, when a one point cut is made for each additional off-kernel. Kernels missing may be counted as mixed, at the discretion of the judge. Differences in shade of color of grain or cob are scored according to variety characteristics.

4. Shape of Ears: All ears should be cylindrical with straight rows and with proper proportion of length and circumference. The shape of the ear should conform to the variety type; thus Leaming ears should be slightly tapering.

5. Uniformity of Exhibit: Ears should be uniform in shape, length and circumference.

6. Tips of Ears: Oval shape and regularly filled out with large dented kernels. In selecting for seed it is sometimes not advisable to insist that the tip be covered. If well covered tips are selected year after year the ears will become shortened and more will be lost than gained.

7. Butts of Ears: Kernels rounded over the end of the cob in regular manner, leaving a deep depression where shank is removed. Properly filled butts indicate perfect pollination and a relatively high proportion of corn to cob. At present there is not as much stress laid upon good butts and tips as formerly. A good butt, however, is more important than a good tip.

8. Kernel Uniformity: Kernels from the same ear and from the several ears should be uniform in size and shape. The kernels that have been removed should be carefully compared. Ears should be discarded whose kernels are exceptionally large or small, broad or narrow, long or short. Kernel uniformity is more important than ear uniformity. The planter cannot be made to drop regularly if the kernels are irregular. Other things being equal, too long kernels indicate that the corn will be too late in maturing. The shortest kernels ripen early but do not produce as much corn. Since the general tendency

NOTE: A part of this chapter pertaining to the explanations of the corn score card was taken in the main from the Eleventh Annual Report of the Illinois Corn Growers' Association.

is for kernels to become more shallow, deeper kernels should be planted than is desired in the crop. See illustration.

9. Kernel Shape: This should conform to the variety type. Generally speaking, kernels should be wedge-shaped and full at the germ end, except Champion White Pearl, which should be smoothly indented with rounded top and nearly as wide as deep.

10. Space Between Rows: Furrows between rows and spaces caused by round corners of kernels, which should be narrow, deep and sufficient for perfect ventilation. See illustration.

11. Space Between Kernels at Cob: There should be little or no space in row between kernels at cob. Considerable space in the row between the kernels indicate immaturity and lack of vigor. Such ears should not be used for seed. See illustration.

12. Vitality, or Seed Condition: Ears should be ripe, sound, dry and of strong vitality. Grains of a pinkish color are objectionable, since they indicate a diseased condition. Three dead ears disqualify an entire exhibit. This is the most important point in the score card as well as in selecting corn for planting.

13. Trueness to Type: Conforming to variety characteristics in variety classes and to the prevailing type in general classes, type is determined largely by the shape and uniformity of the kernels. In fact, if kernels are uniform and of the shape and indentation characteristic of the variety in question, the ear or exhibit may be said to have good type.

14. Proportion of Shelled Corn to Ear: In determining the proportion of corn to cob, weigh each alternate ear in the exhibit. Shell and weigh the cobs, and subtract weight of cobs from weight of ears, which will give weight of corn. Divide the weight of corn by the total weight of ears to get the percentage of corn. For each per cent short of standard for the variety, a one-point cut is made.

We have tried to explain as clearly as possible in this chapter, the factors which enter into the selection of corn for seed and exhibition purposes. To tell on paper how to select corn is almost impossible. For this reason we urge all readers of this book to attend the nearest short course in corn judging if the opportunity presents itself. No matter how little or how much you know about corn, you will learn things that will be of practical benefit to you, as a corn grower, by attending one of these short courses. There are no charges made for taking these courses. Ralph M. Ainsworth, secretary of the Illinois Corn Growers' and Stockmen's Convention, held at Urbana, will be pleased to send the program and schedule to anyone writing to the address on the title page of this book.

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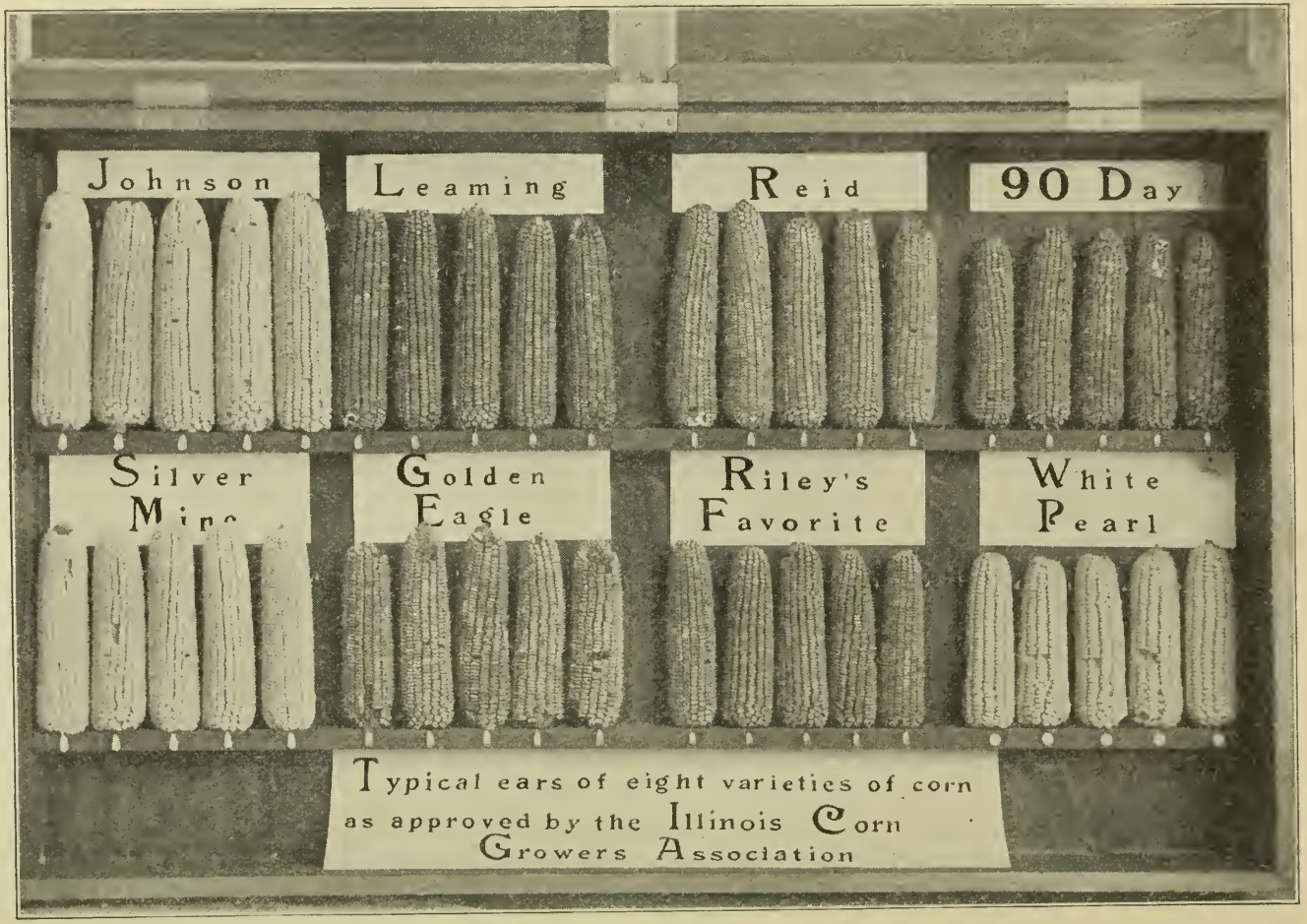

Johnson
Leaming
Reid
90 Day
Silver
Golden
Eagle
Riley's
Favorite
White
Pearl
Typical ears of eight varieties of corn
as approved by the Illinois Corn
Growers Association

CHAPTER X

THE "EAR TO THE ROW" BREEDING PLOT

Corn has improved greatly in type and yielding qualities in the last twenty years. From a long, slender ear on a tall, heavy stalk, corn has been bred to a cylindrical ear with deep grains, showing a percentage of grain to ear of between eighty-five and ninety.

This improvement in type and yielding qualities has been due to two things: First, the breeding plot; secondly, field selection. Improvements through the breeding plot are accomplished largely in a mechanical way,—by the use of scales. Field selection is done by the picker ever keeping before him the ideal that he is striving to obtain.

To make the greatest progress in corn improvement, it is necessary to combine breeding plot and field selection.

On the following pages we will give as well as we can our method of conducting an "ear to the row" breeding plot.

Planting a Corn Breeding Plot

In starting a breeding plot, one hundred of the most desirable ears are chosen. The ears of course should be well matured and sound and the type as good as can be obtained, since a mistake in the first selection may set the breeder back a year or two. It is better to make a record of the measurements of ears. (Illinois farmers can obtain blank registers by applying to L. H. Smith, of the University of Illinois.) If a breeding plot has been conducted before, ears, of course, should be selected from the highest yielding rows of the previous year's plot.

After the description of the ears has been recorded, they are shelled separately and the kernels of each placed in small paper sacks. These sacks are tagged from one to one hundred and are then placed in a grain sack and hung away from the mice until time to plant in the spring. The best time and place for this work is in the winter before the kitchen fire.

In order to prevent foreign pollenization the breeding plot should be situated in a large field of the same variety. A very convenient size of breeding plot is forty rods long and one hundred rows wide (about twenty rods). Assuming that the breeding plot is to be located in a forty-acre field, the first thing is to stake off six or seven acres that contain no ponds, and where the soil is of uniform richness. If the ground of the whole field is prepared as corn ground should be prepared, it is not necessary to give the breeding plot any extra preparation. Planting should be done in the regular way until the breeding plot is reached.

Before starting on the first row of the breeding plot, the corn is all removed from the planter boxes and heavy paper cones are inserted, if an edge drop planter is used. This is to keep the corn from shifting to the center of the box. The corn in sacks No. 1 and No. 2 is placed in each planter box. If planted three grains to the hill, it will easily plant the 40 rods, unless the ears were exceptionally small.

A stake should be driven at the end of the plot. As soon as the driver is even with this stake, the regular field corn is placed in the planter box. This corn is planted to the end of the field and back to the stake. When opposite the stake on the return, the driver stops and removes all the field corn in the planter boxes, empties into them the contents from sacks No. 3 and No. 4, and plants to the place of starting.

Four rows from ears Nos. 1, 2, 3 and 4 respectively, have now been planted. The corn from ears Nos. 5, 6, 7 and 8

Breeder R. M. Ainsworth
Variety Johnson County White
Strain Ainsworth

CORN REGISTER

OF EARS PLANTED AND ROWS HARVESTED IN SEASON OF_____

Distance between hills 3'6"
Number of hills in row 188

DESCRIPTION OF INDIVIDUAL SEED EARS

Register No.	Dam No.	Annual Ear No.	Length of Ear.	Tip Circumference of Ear.	Butt Circumference of Ear.	Number Rows of Kernels	Number Kernels in Row.	Weight of Ear.	Weight of Cob.	Tip Circumference of Cob.	Butt Circumference of Cob.	Per Cent Protein in Grain.	Per Cent Oil in Grain.
326	228		11 2/8	6 6/8	8	18	62	20 3/4	2 3/4	4 3/8	4 6/8		
327	228		10 6/8	6	7 1/8	20	67	18	2 3/4	4	4 5/8		
328	228		11	6 1/8	7 5/8	19	64	18 1/4	2 3/4	3 3/8	4 5/8		
329	228		11	6 3/8	7 6/8	20	60	20	3	4 3/8	5		
330	228		10 5/8	6 5/8	8 1/8	18	62	21 1/4	3 3/4	4 1/8	5 1/8		
331	228		10 6/8	6 5/8	7 5/8	20	61	19 1/4	3	4	4 5/8		
332	228		10 7/8	6 5/8	7 3/8	18	59	19	3	3 3/8	4 5/8		
333	228		10 7/8	6 5/8	7 3/8	20	59	19	2 3/4	4 1/8	4 5/8		
334	230		10 5/8	6 3/8	7 3/8	18	59	18	3 1/4	4 1/8	4 5/8		
335	230		10 5/8	6 5/8	7 5/8	20	56	20 1/4	3	4 3/8	4 5/8		
336	230		10 5/8	6 5/8	7 3/8	18	58	17 3/4	3 3/4	4	4 5/8		
337	230		10 7/8	6 5/8	7 3/8	18	58	19 1/4	3	4	4 3/8		
338	230		10 5/8	6 5/8	7 5/8	20	58	18	3	4 1/8	4 3/8		
339	230		10 6/8	6 3/8	7 3/8	20	63	18 1/4	2 3/4	3 5/8	4 3/8		
340	230		10 3/8	6 5/8	7 1/4	20	66	18 3/4	2 3/4	4 1/8	4 3/8		
341	230		10 5/8	6 5/8	7 3/8	18	64	17	2 3/4	4	5		
342	230		10 5/8	6 5/8	7 3/8	18	60	17 3/4	2 3/4	4 3/8	4 5/8		
343	246		10 3/8	6 1/8	7 1/8	16	60	14 1/4	2 1/4	4 1/8	4 3/8		
344	246		10 3/8	6 3/8	7 3/8	16	58	16 3/4	2 1/4	3 5/8	4 5/8		
345	246		10 5/8	6 5/8	7 3/8	18	58	16 1/4	3	4 5/8	5		
346	246		10 5/8	6 5/8	7 3/8	18	63	18	2 3/4	3 3/8	4 5/8		
347	246		10 3/8	6	7 1/8	18	62	16 3/4	2 1/4	3 3/8	4 3/8		
348	246		11	6 1/8	7 3/8	18	67	17 3/4	2 3/4	3 3/8	4 5/8		
349	246		11	6 5/8	7 3/8	18	66	17 3/4	2 3/4	4 1/8	4 3/8		
350	246		10 5/8	6 3/8	7 3/8	20	64	17 3/4	2 3/4	3 3/8	4 5/8		

PERFORMANCE RECORD OF FIELD ROWS

Planted in Field Row No.	Corn Pounds Per Row.	Corn Bushels Per Acre.	Total Number Ears in Row.	Per cent Protein in Grain.	Per cent Oil in Grain.
26	203	58	343		
27	221	63	375		
28					
29	164	46	401		
30	161	46	304		
31	207	59	382		
32					
33	258	73	391		
34	197	56	360		
35					
36					
37	354	101	374		
38	180	51	360		
39	241	68	365		
40	257	71	391		
41	245	70	350		
42	243	69	338		
43	194	55	322		
44	175	50	317		
45					
46	213	60	375		
47	168	48	380		
48					
49	181	51	354		
50	189	54	374		

Remarks: Planted 8 grains to the hill, June 10th. Thinned down to two stalks to the hill. Some grew after being cut off, which accounts for the large number in some hills. Alternate rows detasseled Aug 1st, 2nd, 11th.

Average Yield Multiplying Plot (Year 1914) 91 bu per A.
Average Yield Commercial Field (Year 1912) 84 bu per A.

are planted on the next round and so on until the plot is finished. As soon as a row is planted, it is well to tie the tag on the fence just back of the row. If the tags are substantial they will serve to mark the rows until the breeding plot has been cultivated the last time. After the corn is laid by, it is best to place numbered stakes at the end of each row. (See illustration.) For convenience, the two sacks to be planted on each return should be taken to the far end of the plot by the driver, placing them in his pocket as he starts each round. As soon as the breeding plot is finished, the planter boxes are filled with the regular seed of the same variety and the rest of the field is planted.

Now we have a breeding plot in a large field of the same variety. It is surrounded on three sides with the same kind of corn, which prevents foreign pollenization. If the 100 ears were carefully shelled and placed in candy sacks as suggested, it should not take more than five hours longer to plant this corn than if planted in the regular way. The breeding plot is cultivated at the same time as is the entire field; in fact, one would not know that the breeding plot existed if it were not for the tags at the end of the rows. To secure a uniform stand, it is well to thin down to two stalks to the hill after the corn has been plowed the first time. The ears will be larger with two stalks to the hill than with three.

Detasseling

It is almost necessary to detassel alternate rows. If not detasseled, the corn in each row, being from a single ear, would otherwise be closely inbred. When the alternate rows are detasseled, the product of the detasseled rows only is used. It can readily be seen that by this method cross pollenization is insured.

Tasseling time usually comes at a very busy season of the year, which makes it necessary to get the work done quickly as well as thoroughly. This work can be done easily by going between the rows astride a horse muzzled to prevent destroying the corn. The tassels should be pulled, never cut. The field should be gone over the first time when about two-thirds of the tassels are just beginning to show. A second going over a week later will get practically all of the remainder, providing the work is carefully done. About two weeks after the detasseling, the plot should be gone through and all suckers and barren stalks removed. If there are many suckers the breeder will be well repaid for this work by the increase in yield.

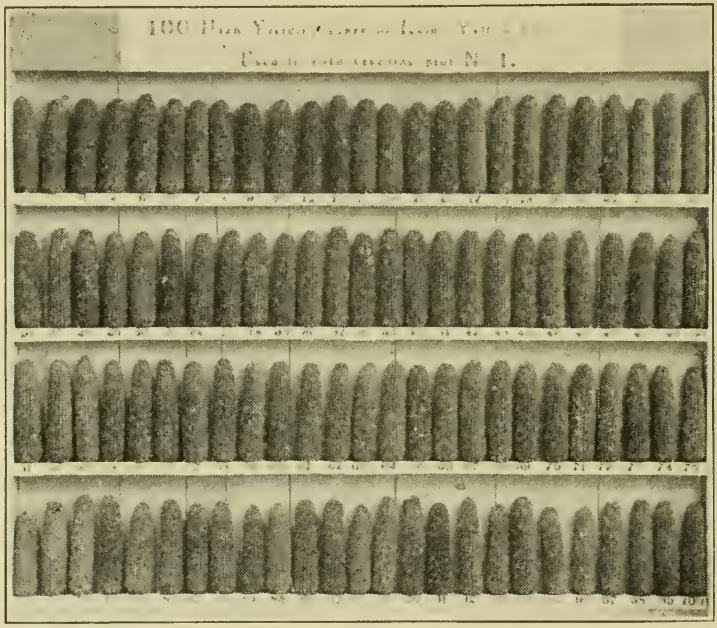
Making Observations

The best time for the breeder to make observations for maturity, soundness and position of ear on the stalk, is when the earliest rows have just matured. The beginner in corn breeding will be surprised to notice that the husks in some rows will be brown and dry, while on other rows they will be quite green.

When it comes to deciding what rows to reserve, your opinion should be guided largely, but not altogether, by the weight of corn in the individual rows. If the scales alone were to make the decision, they would very likely indicate that we should keep one of the latest maturing rows, since they are often the highest yielders. To decide by weight alone would be a very serious mistake. It is not necessary to husk out and weigh separately every detasseled row in the breeding plot. The rows that promise apparent quality should be weighed out, and only those kept for seed that show a yield above the average.

Breeding and Field Selection

The purpose of the breeding plot is to determine qualities not apparent in field selection. No one, not even an expert corn judge, can pick out the highest yielders merely by looking at the individual ears. In picking for quality one might, unknowingly, turn down high yielders. The breeding plot and the scales give the inherent quality, while score card



ONE HUNDRED HIGH YIELDING EARS
OF REID'S YELLOW DENT
Used in 1913 breeding plot

selection indicates apparent quality and even show corn. But show corn does not always possess the greatest utility. Hence, the selection with the ideal in mind should be combined with the breeding plot and scales in order to obtain seed corn that will grow the greatest number of bushels.

In a herd of 25 brood sows it seldom happens that the

finest show animal is the most prolific, the best mother, etc. What the individual animal has done in the past is her performance record. This is the best assurance of what she will do in the future. At the same time, it is very desirable that she conform as closely as possible to the score card.

The same is true of corn. Corn is even more susceptible to breeding than either cattle or hogs, since there is more room for improvement. For the farmer to know that his seed corn for the coming season is from a high yielding strain and will show a high germination test should be as important to him as to know that his hogs are prolific or that his cattle are easy feeders.

Results Obtained in Breeding Corn

Progress in corn breeding is necessarily slow. Nevertheless, it should be every breeder's earnest endeavor to make this progress steady and sure. To be perfectly candid, we must say that in not a single instance have we ever obtained spectacular results in corn breeding. If one were to start with a very low type of corn the results through careful selection and breeding would undoubtedly be very marked. But starting with the very best type of the several varieties, the improvement is not so rapid. In order not to be handicapped, the breeder should always start with the very best seed that can be obtained.

Our own work in corn breeding tends to show that the ear has very little hereditary tendency to reproduce itself in size. The matter of size depends more on local field conditions and the hereditary tendency of the kernel. On the other hand, like kernels from small and large ears of the same variety often produce ears of the same size. This tends to prove that a good shaped kernel is of more importance than a good shaped ear. Medium sized ears out-yield exceptionally

large ears because the very large ear is generally later in maturing. Hence, the kernel does not have the vitality possessed by the kernel from the smaller ear. We believe, by carefully selecting our seed from the high yielding rows in the breeding plots and, at the same time, following the rules for field selection, we can accomplish as much in one year as we could in five by using field selection alone. We are so sure of this that we are conducting three breeding plots. Since the results of the breeding plots are always affected to a considerable extent by season and varying soil conditions, we are not prepared, as yet, to make the above statements dogmatically. It will take several more years' experiment on our part to prove or disprove the above points. The breeder who guesses at results is a hindrance and not a help to corn improvement.

There are other points, however, on which we are convinced beyond a doubt: First, a medium type of any variety of corn will out-yield a very rough type. The result of last year's breeding indicates that the rough type averaged in yield only 89.6 per cent of that of the medium type. Mr. Chas. A. Rowe of Jacksonville has obtained practically these same results.

Some breeders have had results proving that a very smooth type will out-yield the rough. We consider, however, the smooth type a dangerous extreme, since it does not dry out as well as the rougher type. (The rougher the type the longer the average length of kernels.) Our results show that the detasseled rows do not yield as well as the rows where the tassels are not interfered with. Even if the work is carefully done, pulling the tassels cuts the yield about 5 per cent. The loss is correspondingly greater if the work is carelessly done. This shows that detasseling should be undertaken only in the breeding plot and for the express purpose of insuring cross pollenization.

DETASSELED "EAR TO THE ROW" BREEDING PLOT

Suckering corn and cutting out barren stalks increase the yield sometimes as much as forty per cent, depending on the number of suckers and the dryness of the season. Our greatest gain was the result of cutting out over half the stalk growth on a very dry year (1913). The sooner this work can be done after the corn tassels, the better. Two men in six days can cut out the suckers and barren stalks in the average forty-acre field. It is not necessary to have an "ear to the row" breeding plot in order to test the results of detasseling and suckering. These two experiments can be made in any field of corn.

There are hundreds of things to be determined by corn breeding, but the work is so slow that no one individual can be expected to establish more than a few facts. Realizing that co-operation was necessary in order to make the most rapid progress, the Illinois Seed Corn Breeders' Association was organized in 1900. One member of this association, Louie H. Smith, assistant chief in plant breeding at the University of Illinois, has succeeded in breeding a high and low protein and high and low oil corn. Mr. Smith's work along this line of breeding has extended over fifteen years. His results are undoubtedly the most pronounced of any that have been attempted in corn breeding.

The work of producing hybrid seed has been carried on by H. J. Sconce, of Sidell, Ill. Mr. Leigh F. Maxey, of Curran, Ill., has perhaps done more than any other individual in breeding and establishing the type characteristic of Leaming corn.

Obstacles to Contend with in Breeding Corn

The corn breeder is often discouraged by adverse conditions over which he has no control. Cutworms may make the stand so uneven that the weight of the corn in the indi-

vidual rows would be of no advantage. We have had a breeding plot ruined by water standing in a depression in the center of the field. If the scales are to help select seed by pointing out high yielding strains, the stand must be uniform.

This last summer of 1913, which was one of the dryest crop years we have ever seen, was a poor year for indicating the relative value of seed from the different rows. We do not consider our results from that year's breeding to be of half the value of those obtained in 1911 and 1912. While these facts are discouraging, the corn breeder is still better off than the grower of pure bred hogs, who may lose his entire herd from cholera.

Caring for the Best Ears

After the corn has been carefully husked and weighed, the best ears from the most desirable rows should be carefully dried by laying on racks. The racks can be of wood or wire, or the corn can be strung on binder twine. If the breeding plot is gathered in October, it can safely be dried by hanging in a dry loft; but if gathered later, it is generally best to dry in a mildly heated room, since the germ might be injured by a sudden cold spell coming before the moisture was all out of the ear.

One should never go to the other extreme and lay corn on boards over the furnace. This, of course, will soon dry the corn, but it will also cause some of the oil to evaporate, which undoubtedly weakens the germ.

These methods of securing high yielding seed may seem too expensive to some, but when one stops to consider that an increase of only ten per cent often means a difference of from 100 to 400 bushels, on the average farm, one can see that this time is well spent.

Corn shows and short courses in corn judging are for

the purpose of educating farmers and farmers' boys to grow more prolific seed and to know how to select and care for it through the winter. To get the greatest benefit from these courses offered in corn judging, they should be supplemented by practical work in corn breeding on the farm.

This chapter has been taken in the main from an article in the January 15th issue of the Prairie Farmer entitled "Breeding Corn for Quality and Productiveness," by Ralph M. Ainsworth.

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CHAPTER XI

DRYING AND STORING SEED CORN

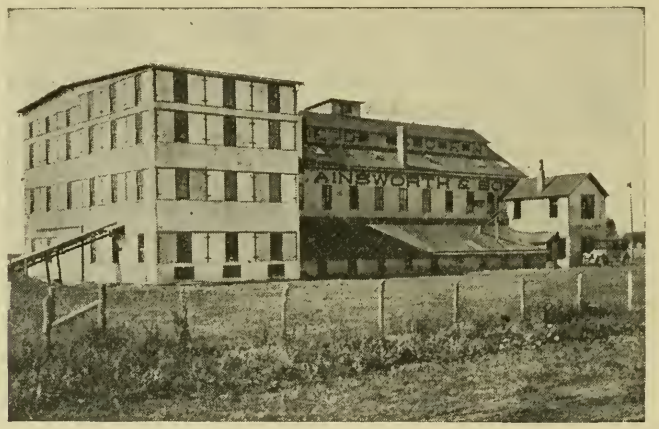
The importance of preserving all the vitality by gathering the seed corn for next year's planting before cold freezing weather sets in is being appreciated more and more by farmers and corn growers. There are, however, a large number of farmers who still depend for the coming year's seed upon the occasional good ear found throughout the husking season. Still others are satisfied with the best looking ears found in the corn crib in the spring. The loss sustained by these two classes varies with the mildness or severity of late fall weather and the picker's ability to detect the sound from the unsound seed ears.

Let us say right here that even the most experienced are sometimes deceived in the condition of the ear by the appearance of the germ. A yellow or brownish embryo and germ indicate that the corn has been frozen. When the embryo is wrinkled or pale in color it usually means a loss of vitality due to long storage. Old corn that has been carried over one summer should never be planted if sound new corn can be secured. While old corn will usually grow, it is always slow in starting, due to the evaporation of some of the oil from the germ.

A good healthy germ and embryo should be nearly white; but germination tests prove that some kernels have white clean cut germs and still send up a weak sprout due to exposure and bad storing. The only way to be sure that seed will grow is to plant only seed that has been carefully dried before hard freezing weather sets in.

Time to Gather Seed Corn

In this latitude, October is undoubtedly the best month in which to gather seed corn. If this important work is put off until the middle of November, the vitality of the seed may be injured by wet weather, followed by a hard freeze. On the other hand, it is not a good plan, as a general rule, to gather seed as early as September. Unless there are indications of early freezes, corn should be allowed to ripen in the field. Professor P. G. Holden, in "Successful Corn Culture," says, "It is not a good plan to harvest the seed in



MODERN SEED CORN DRYING PLANT

September while the corn is immature, as it is more difficult to preserve, will be chaffy and give weaker plants than corn which has been allowed to fully mature on the stalk." Seed corn that has been picked before it is matured shows a shriveled condition of the kernels after it is thoroughly dried.

Best Place for the Farmer to Store Seed Corn

A storeroom or bedroom that can be spared is the best place for the farmer to store seed corn. The attic, if not too inaccessible, is also a good place, although zero weather before

the corn was dry would weaken some of the sappiest ears unless the attic could be heated. Notwithstanding the danger of frost, the attic is far ahead of the cellar. If there is a furnace in the cellar the corn is apt to dry too quickly or to become too dry. Remember, if corn is allowed to become too dry, it will be slow in starting in the spring. If there is no furnace in the cellar, the corn will dry too slowly unless it is well dried before being placed there. Again, the average cellar does not have sufficient ventilation for the proper drying and storing of corn. On all good drying days the windows should be thrown wide open. There is nothing that dries seed better than a warm, dry breeze blowing through it as it lays on the racks. When the weather is damp, the windows should be closed if a door can be opened into the rest of the house. If not, the windows should never be closed entirely, unless the room is very large and the amount of corn small. If a tight room is filled with new corn, the corn is apt to mold, no matter how well it is hung up, unless the room is constantly ventilated. Moisture, as it leaves the corn, must have some means of escaping.

Laying on Racks

For several years past, we have dried all of our ear seed corn on wooden racks. These racks are built of one by four inch uprights in which tenpenny nails are driven every four inches and on which heavy lathe are laid. (See illustration.) The racks are all placed on slatted floors which permit perfect ventilation. There are a number of good ways to dry seed corn. An old and very good plan is to string the ears on binder twine and suspend them from the ceiling. Of late years, various kinds of wire hangers for drying corn have been placed on the market. If these hangers are not placed too close together they will dry the corn as well as any other

STORING SEED CORN ON SINGLE ROW RACKS

method. If the hangers are made out of woven fence wire, they tangle badly when the corn is removed, and, if made of steel, they are rather too expensive.

Storing Seed Corn on a Large Scale

In order to dry corn to the best advantage, the drying room should be so constructed that it can be thrown open on all sides in mild weather. It should be tight enough when closed up to enable it to be evenly heated in cold weather. A plant built especially for drying corn for seed should be tall with the floors slatted to allow a free circulation of air from bottom to top. There should always be ventilating flues in the roof, and these should never be closed until the corn is dry. Corn should be gathered early and taken direct to the plant where it is picked over the same day and laid on racks or put in ventilated cribs. Corn, to show the highest germination, should be gathered as soon as it has ripened in the field and stored in a room that is frost proof and at the same time thoroughly ventilated.

Great advancement has been made in the last ten years in the construction of buildings made especially for the drying and preparing of seed corn for market. Some well ventilated and thoroughly heated plants have not given the best results, simply because they were filled too full of seed corn. We are of the opinion that in order to obtain the best results, no seed drying plant should be filled to more than one-half of its crib capacity.

CHAPTER XII

PREPARING SEED CORN FOR PLANTING

There is only one way by which the farmer can be certain that his seed corn is strong in vitality, that is, to give it a germination test. By an examination of the germ, most of us can tell whether the kernel is healthy or dead; but no man's judgment can be depended upon to detect unerringly the strong from the weak. For this reason, a sample from all corn to be planted should be tested and, if it does not show a germination of at least ninety-five per cent, each individual ear should be tested.

One hundred good sized ears will plant ten acres. One man can easily examine and place in the tester the kernels from four hundred ears in one day. This is enough seed to plant forty acres, and if only a few weak or dead ears are revealed by the test, the farmer is well repaid for his trouble.

This question is often asked, If the corn is selected from the field before freezing weather sets in and is properly dried will it be necessary to test it? If all this has been done, it will perhaps not be necessary to test each ear; but in order to be sure the seed is strong, a fair composite sample should be tested. If the results do not show uniformly strong sprouts, the ears should be individually tested and the weak thrown out. There are so many different conditions that can weaken the vitality of seed corn that the only safe plan is to test at least a sample.

All seed sent out by reliable seed corn growers is sold under a definite germination guarantee of from ninety to ninety-seven per cent. This germination is determined after

making numerous tests from all parts of the plant. If a certain percentage of germination is guaranteed the grower is honor bound, as well as required by law, to replace or return the purchase price for all seed falling short of germination standard.

If there is any doubt about the vitality of seed corn purchased from a seed firm or neighbor, it should be tested before making a complaint. A conservative seed corn grower will always guarantee less than the results of the germination tests, as most breeders do. A guarantee of ninety-five per cent is a strong guarantee for seed that will usually go over ninety-nine per cent.

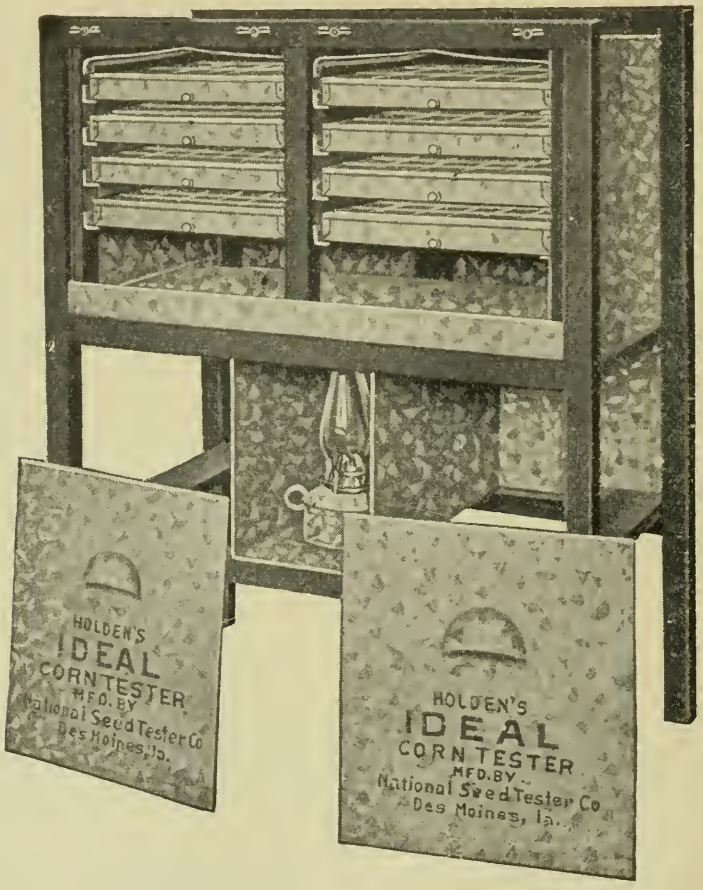
Some customers, in placing their order for seed corn, state that they expect to test the seed when it arrives; and if it does not test a certain amount, it will be returned. This is sometimes a stiff proposition but it is made fairly and squarely. The breeder alone knows whether or not his seed will come up to the requirements and the order should be accepted or declined accordingly.

The Four Essentials of Germination

All seeds, to make the most rapid growth, must be strong in vitality. The seed bed also must be of the right temperature and must contain the proper amount of moisture and oxygen.

If corn is gathered before it has had time to ripen in the field, the kernels will be immature. Immature corn, due to the larger amount of sugar in the kernels, will usually germinate rapidly under ideal conditions, but since it has a small reserve of plant food, the kernels will rot if the ground is cold and wet, before the young rootlets have a chance to draw from outside sources.

Again, the vitality of the seed will be weakened if subjected to either repeated freezing or high temperatures. Corn will germinate between the wide variation of from forty-eight to one hundred and fifteen degrees. It will make the most



MODERN SEED CORN TESTER

rapid growth, however, at ninety-three degrees. Since it will make a more hardy growth at about eighty degrees, this is perhaps the best temperature for germination.

Moisture is just as essential as proper temperature. Water softens the seed covering, dissolves the plant food and carries

it to the growing embryo. Too much moisture, however, means too little oxygen. This is the principal reason for seed rotting in heavy, wet land. Corn cannot make rapid growth without an abundance of air.

The Seed Tester

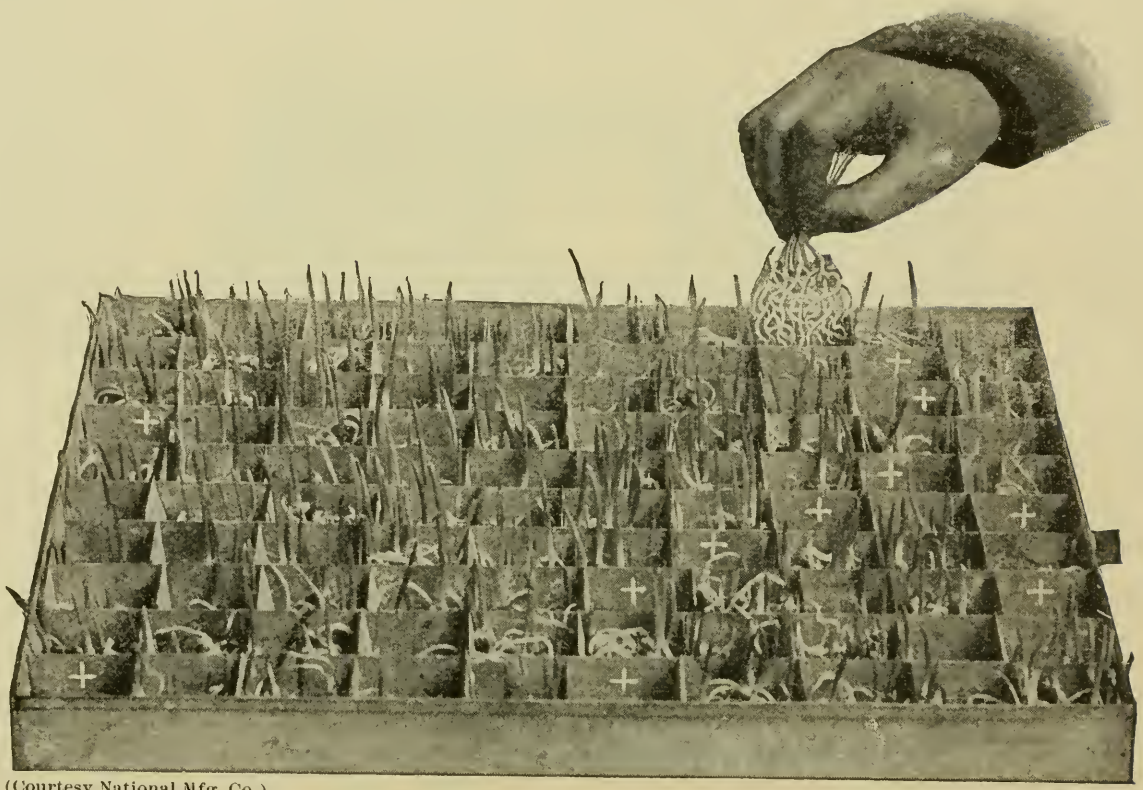
Conditions which apply to the field apply equally well to the seed corn tester. If the seed corn tester is to show accurately by its results the true condition and the relative value of the different ears, it must provide sufficient moisture, give ample ventilation, and keep the temperature between sixty and one hundred degrees. It had better fall below sixty degrees than go above one hundred degrees. In order not to give some of the kernels an advantage over others, the moisture, temperature and ventilation should be uniform in all parts of the tester.

The trays should be pigeonholed off in such a manner that the kernels from each ear can be placed in a separate pocket so that their identity will not be lost. A good time to test seed corn is in March. This is late enough for all the ears to show their true condition and is early enough to allow the farmer to procure more seed, if the test is unsatisfactory, before spring work requires his attention.

Shelling and Grading Corn for Planting

Before corn is shelled, it should be carefully tipped and butted since the tip and butt grains are irregular in size, besides being smaller and larger than the type desired. After the uneven grains are shelled off the tip and butt ends, the remaining kernels should be carefully examined and all off-colored or undesirable grains removed.

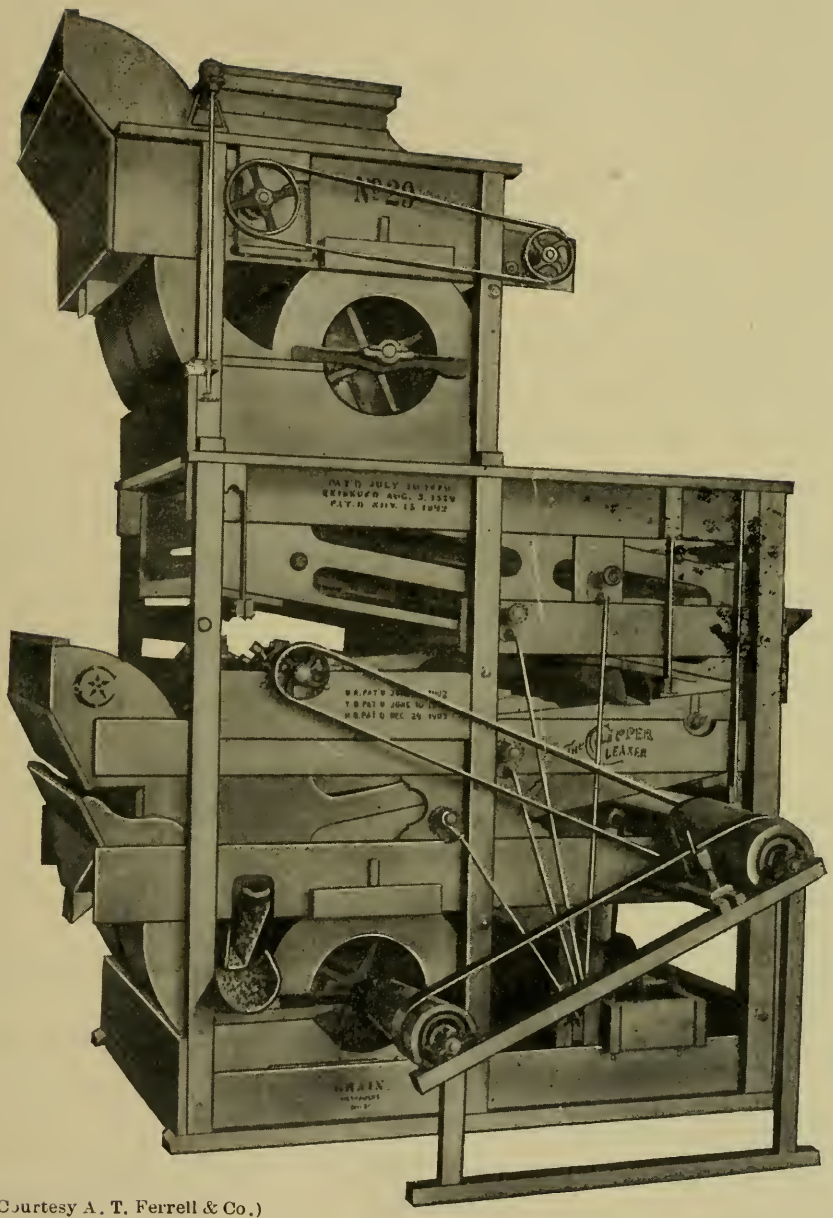
The ears are now shelled. If the shelling is done by



(Courtesy National Mfg. Co.)

TRAY FROM THE SEED CORN TESTER

The tray is partitioned off to hold separately the kernels from each ear



(Courtesy A. T. Ferrell & Co.)

LARGE SEED CORN GRADER

machinery, the spring tension should be as loose as possible consistent with effective work. If considerable corn is cracked in shelling, the indications are that the corn was either too dry, or the sheller is not properly adjusted.

In order to secure a uniformity, a corn grader should be used. There are hundreds of corn graders on the market. They range in price from five dollars for small ones to eight hundred dollars for large graders used in large seed corn drying plants. The very cheapest corn graders will do better work than will the average farm fan mill. A good grader should take out all the large and small grains and about nine-tenths of the cracked kernels.

It is necessary to take out from twenty per cent to forty per cent in order to have an even grade. The difference in yield between graded and ungraded seed is often as much as ten bushels per acre. This difference is due to the more even planting of graded seed, not because the smaller and larger kernels are poorer yielders.

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CHAPTER XIII

INSECT ENEMIES AND PLANT DISEASES

Of all the obstacles to the successful growing of corn, none has ever shown itself in a more serious aspect than the destruction due to injurious insects and plant diseases. The problem of how to control them is a hard one and should receive the attention of every farmer.

We do not feel competent in ourselves to handle this subject of insects and diseases attacking corn, and for this reason we have appealed to Prof. S. A. Forbes, Illinois State Entomologist, who has carefully helped us by correcting and revising this chapter. In addition to this we want to thank Professor Forbes for furnishing us illustrations of insects.

On the following pages we shall describe briefly the more injurious of these insects, and suggest remedies with which to suppress them.

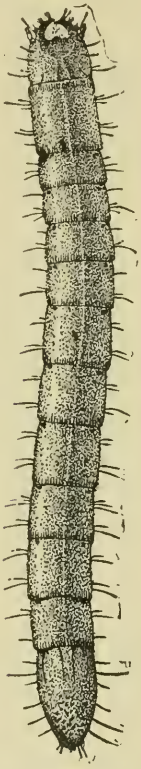
Insects Injuring the Seed After Planting

The Corn Wireworm (Several species of *melanotus):* These are the larvæ (offspring) of the common snapping beetles. They are hard, smooth-skinned, reddish brown, worm-like creatures, and vary in size from the thickness of a pin to the thickness of a darning-needle. The body is divided into thirteen segments, and has three pairs of short, stout legs.

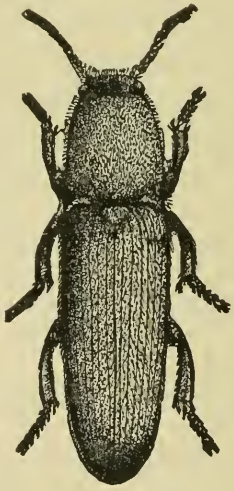
The corn wireworm eats into the kernel after it has been softened by the moisture in the ground, and also bores into

and even through the underground part of the stalk. This usually results in the total destruction of the plant.

Their eggs are laid most commonly in grasslands, and their life history is such that their injuries to corn are most severe the second year after grass. Late fall plowing and



The Corn Wireworm (Melanotus cribulosus,) larva.



The Corn Wireworm (Melanotus cribulosus) adult.

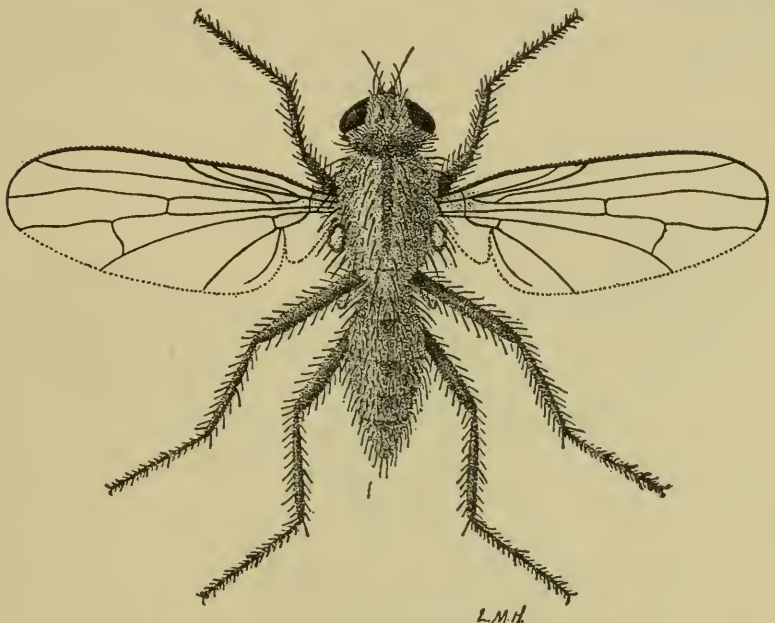
crop rotation with frequent clover crops are the practical methods employed to prevent injury by this insect.

Seed Corn Maggot (Phorbia fusciceps): This maggot eats the interior out of both sprouting and unsprouted kernels. The adult is very similar in appearance to the common

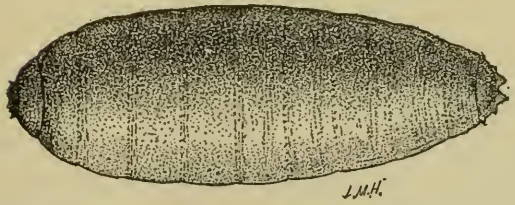
house fly. Severe injuries by this insect are unusual, and there is no known method of preventing them.

Insects Attacking the Roots

The Corn Root Louse (Aphis): Every farmer has noticed the little blue insects clustered in great numbers on the



ADULT OF SEED CORN MAGGOT
Phorbia Fusciceps



LARVAE OF SEED CORN MAGGOT
Phorbia Fusciceps

roots of the corn. They feed on the juice of the corn root, and if present in large numbers sometimes kill the plant. Later in the season another kind of aphis is found on the

leaves, husks and tassels of the plant. There seems to be a partnership existing between the corn root louse and the common field ant. The ant places the young of the aphis on the roots of the corn plant and for this service it feeds on a liquid known as honeydew, which exudes from the body of the louse.

Remedy: Thorough cultivation, by checking the work of the ants has a wonderful effect in lessening the number

THE CORN ROOT LOUSE
Aphis maidiradicis (female)

of the lice. If the ants are working much around the hills we harrow the young corn. Where furrow openers are used the harrowing pulls loose dirt around the hills and effectually checks the work of the ants until after the next rain. Rotation, however, is a standard practical method of checking the injury although it cannot be said to eradicate this pest.

As the ants winter in old cornfields, with the eggs of the

root lice in their nests, the best preventive of injury is to prepare the field for corn by deep and early plowing and repeated discing. This tears up the ants' nests and scatters the root-louse eggs through the dirt, at the same time keeping down the young weeds upon which the root lice live until the corn begins to grow.

The corn root louse has perhaps worked a greater injury to corn than any other one insect. Every farmer should

THE CORN ROOT LOUSE
Aphis maidiradicis (female)

study the habits of this insect and make every effort to check its injurious work.

The Corn Root Worm (Diabrotica longicornis): The adult of the corn root worm is a beetle; green or yellowish green in color and about a quarter of an inch long. The beetle feeds on the pollen and silk and deposits her eggs in the ground at the base of the stalk. The following spring these eggs hatch out into the corn root worms.

Since the corn root worm is dependent for its food upon the roots of the corn the eggs are seldom deposited outside of the cornfield. It is due to this fact that a cornfield is never injured by the corn root worm the first year and even the second year the damage done is usually very slight. But if the field is put in corn three or four years in succession it is very doubtful if the last two crops ever escape without serious injury. In some cases we have known the yield of corn to be lowered from thirty to forty per cent as a direct result of the ravages of these insects.

The corn root worm lives on the roots of the corn plant. They often eat off the ends of the roots of the plant and then burrow just under the outer covering of the root the entire length of the root. The corn root worm can be easily found by carefully splitting an injured root. It is usually about three-eighths of an inch long and about the thickness of a pin and of a white or flesh color.

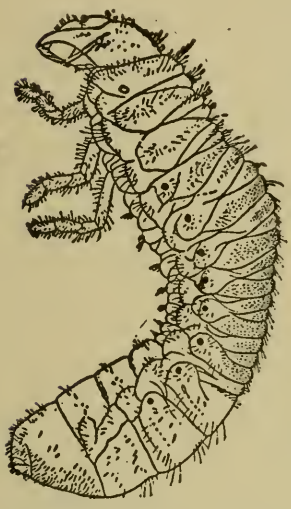
It can safely be said that the damages resulting from the corn root worm are due entirely to the bad practice of continuous corn cropping. If a rotation of crops is adopted in which corn is never grown longer than two years in succession we shall soon have the corn root worm under easy control. If crop rotation were only as effective in checking other insects as it is in heading off the corn root worm, the insect problem would not present the serious aspect it does.

White Grub (several species of *lachnosterna:)* This is the larvæ of the common May beetle. These beetles usually deposit their eggs in fields of grass, timothy and small grains, and especially in the vicinity of timber where they feed.

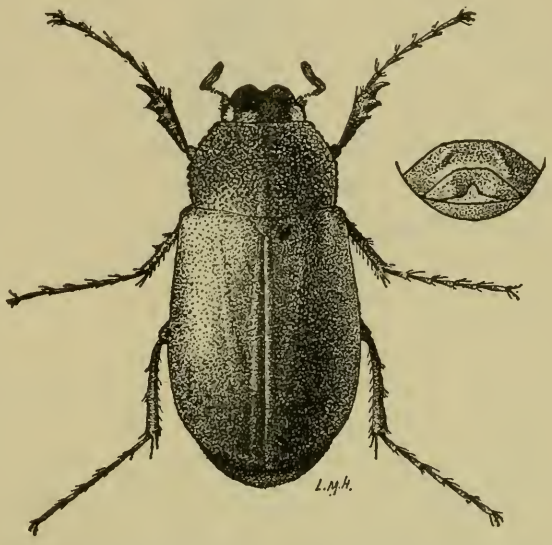
The eggs hatch into small brown-headed grubs, which feed on the grass and corn roots. They do not attain their full growth until the third or fourth year. They are most abundant in old blue-grass pastures. Their presence can

be detected by the fact that the grass dies out in the spots where they are thickest.

The surest way to rid the cornfield of grubworms is to pasture it with hogs the summer before it is put in corn. The hogs will root to a depth of a foot or more in search of grubs. A cornfield that is hogged down is usually free from



White Grub, (L. rugosa)



A June bug, adult of white grub, (Lachnosterna rugosa, a), last segments of male, from beneath

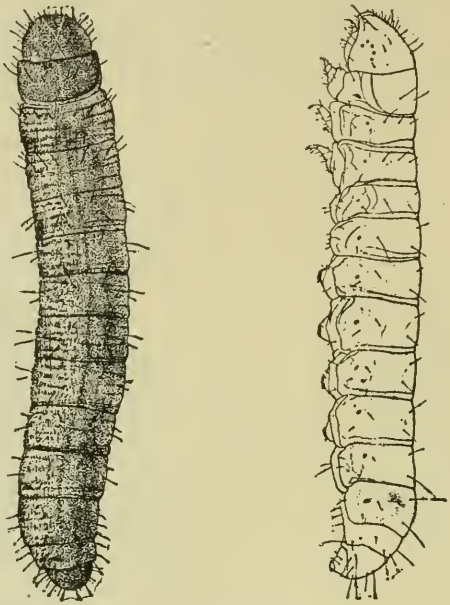
grubs the next year. Rotating with clover and alfalfa is an effective means of checking the grubs.

The 1913 report of the United States Department of Agriculture places the damage from white grubs in Iowa, Wisconsin and Illinois at $7,000,000 during the year 1912.

Insects Attacking the Stalk

Cutworms: There are a number of species of cutworms, all of which are more or less troublesome to the farmer. They are mostly clumsy and greasy-looking caterpillars of

a grayish or brownish color and from one to two inches long. The cutworm works mostly at night and during cloudy weather and stays in its hiding place on bright days.



Glassy Cutworm (Hadina devastrix)

It works its injury to the corn by cutting off the young plant just above the ground. The adults of cutworms are moths.

Adult of Glassy Cutworm

Late fall plowing is almost a sure remedy since the cutworm is thrown on the surface and exposed to freezing weather. At this time of year the worm is in the dormant state and is unable to burrow back into the ground.

A method which we have found very effective in exterminating cutworms on our own fields is to work the ground at such frequent intervals in the spring that every particle of vegetation is destroyed. If no plant growth is allowed to start during April the greater portion of the cutworms will be killed by starvation. This insect cannot withstand hot weather with no green vegetation to feed upon.

Fortunately these worms have many natural enemies; among them are the quail, robin, thrush and other birds, which together keep their numbers down to a considerable extent. These birds are among the best friends the farmer has and should be protected in every way possible. There are many other insects which attack the stalk and ear but the limitations of this book will not permit of their description.

PLANT DISEASES

Ear Rot: This is a mold and belongs to the great group of plants called fungi. The ear rot is whitish or pinkish in appearance and in many cases the husks and silks are cemented to the ear. The affected parts have lost their substance and are light in weight and brittle in appearance.

It is not definitely known how ear rot is caused, but it is generally conceded that moisture and temperature have considerable to do with it. We are of the opinion that dry weather in the fall followed by several weeks of warm wet weather are ideal conditions for the spreading of this disease. We had such a season as this in the fall of 1911, which was the year when dry rot wrought its greatest damage in central Illinois. When the weather conditions are not so favorable the disease seems to be confined to the very tip of the ear, in which case the damage is very slight.

It is estimated that the loss to the corn crop in the United

States from this disease must sometimes amount to at least $25,000,000 in one year.

Remedy: Since the spores live through the winter on the old corn stalks some authorities urge the farmer to burn the old stalks. It is our opinion, however, that the stalks turned under will be a greater benefit to the land than the injury due to the ear rot will be to the crop. Since the ear rot does not attack any other crop than corn it is better to put the field in some other crop and the corn on new ground if the field was badly affected with the disease the year before.

Smut: Besides ear rot, smut is the only other disease which injures corn to any extent. Smut in appearance is greenish white or black and is usually noticed on the green stalk or leaf. Smut grows very rapidly and sometimes forms balls four inches in diameter. These balls are composed of millions of plants which are individually too small to be seen with the naked eye. While infection may be brought about directly by the spore alighting on the corn plant it is chiefly due to the conidia which are the result of the spore germinating in manure or heavily manured soil. While corn smut is abundant all over the United States, it seems that the injury in any one field is never great. Every year we see more or less smut in our own fields, but we have never known a field to be injured as much as one per cent.

It is claimed by many farmers that smut is injurious to cattle and horses and that it is the cause of the corn-stalk disease. In order to prove or disprove this opinion the Bureau of Animal Industry has carried on a number of experiments in feeding smut to cattle and horses. The results of these experiments show that there are no injurious effects produced by feeding smut. The best way to kill smut is to cut out and burn the diseased stalks, but this will not prevent its reappearance unless it is practiced over a large territory.

Rotation, Careful Preparation of the Seed Bed and Thorough Culture are the Best Means of Preventing Insects and Diseases

We stated in the chapter on "Rotation of Crops" that crop rotation was worth more than all other methods combined in checking insect enemies and plant diseases. We want to repeat here that the greater part of the injury resulting from insects and diseases attacking corn can be traced directly to the continuous cropping of corn year after year. The methods we have used in checking these pests on our own farms are crop rotation, thorough and clean culture, and in some cases fall plowing and pasturing with hogs. Various insecticides are practical and helpful to the gardener and orchardist, but in our opinion they are rather too expensive for the Corn Belt farmer. Farmers by co-operation can often accomplish more than they could by individual efforts. All toads, most of the snakes and birds, and many of the insects are the farmers' friends, and should be protected in every way possible.

CHAPTER XIV

CORN LETTERS FROM THIRTY FARMERS

"No man knows all there is to be known about farming—let us all get together and learn from each other."

From the above quotation we received the inspiration to write to thirty-five of the best farmers in the Corn Belt and ask them to give us the benefit of their experience as corn growers. The thirty letters on the following pages are the result of our investigation. It was necessary, because of the lack of space, to condense some of the letters but in no case have we taken anything from these letters because it advocated a practice contrary to our own.

Some of these methods of culture described are different from our own ideas but we are firmly convinced that the letters taken as a whole advocate a practical, thorough culture and represent the methods employed by the best farmers in the different parts of the Corn Belt.

We want to thank, sincerely, our farmer friends who took the time to send us these splendid letters telling how they grow corn. From some of the letters we have received some valuable suggestions which we expect to test out next spring and summer.

Experience is surely the best teacher and for this reason we have tried to eliminate theory and make this book a book of corn experience. How well we have succeeded must be left to the judgment of the reader.

Larchland, Illinois.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—Our soil is heavy, rich and level. I plow what ground I can in the fall and the rest in the spring, and it is plowed as deep as the team can pull the plow. It should be plowed eight to ten inches deep.

All stalks are cut and turned under in order to add humus to the soil. As soon as the ground is plowed in the spring it is harrowed and later it is worked into a seed bed with the harrow and disc.

I use weeders both before and after the corn is up in preference to the harrow.

I start plowing corn when it is from two to six inches tall. The first time over I cultivate deep, but later cultivations are shallower. I cultivate the corn all I have time to, which, of course, varies with different seasons. The cultivation is always continued until the corn is so tall it begins to break under the arch of the cultivator.

I shall look forward to receiving your book on "Practical Corn Culture." Very respectfully yours,

H. KALLISTA.

Arcola, Illinois, April 9th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—I am writing in answer to your letter to give you my experience as a corn grower.

Our soil is a black, heavy loam and is very level; in fact, it is so level that it is necessary to survey before laying tile.

We think our soil is the cream of the Corn Belt, at least that is what the wise men at Champaign tell us.

I prefer to have my corn ground plowed in the fall and usually succeed in getting all the sod and pasture plowed at that time. I am fully convinced that fall plowing should be at least six inches deep.

Since the stalks add humus I prefer to cut them and turn them under. If the tenant farmer is not equipped with implements for cutting the stalks he had better burn them, where corn follows corn, since they will be in the way of cultivation.

If the ground is packed we use the disc, if freshly plowed the spike-tooth harrow in preparing the seed bed. We usually harrow ground just after plowing. I consider all work on the seed bed time well spent.

We plant with a check-rower planter three feet four inches each way. When three to four inches high the corn is cultivated about three inches deep.

The small shovels are used for the first two plowings and for the later cultivating the surface cultivator. The last plowing is not over two inches deep. We cultivate from three to four times, depending on the season. The corn is plowed until it is so tall it breaks badly. If the season is dry we drag between the rows with a planter wheel, single harrow or one-horse cultivator.

Respectfully yours,

JOSEPH COMBS.

P. S.—We are experimenting with alfalfa in a small way.

Weldon, Illinois, April 28th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—Our soil, a deep, retentive loam, is heavy and level. All stalks are of necessity plowed in the spring.

I do not believe in burning stalks. The soil needs all the humus that can be put back on it. Turning stalks under helps to keep the ground loose.

In working plowed ground down, we use the spike tooth harrow and disc. All ground plowed the day before is harrowed down the next morning.

The corn is planted with a check rower planter and is checked three feet six inches one way and three feet four inches the other.

The corn is always harrowed before it comes up and after if it is necessary to kill the weeds.

I start cultivating the corn when it is about four inches tall. Surface cultivators are used altogether, and they are run just deep enough to cut off and cover all weeds. We cultivate from three to four times and lay by when the corn is from three to four feet tall.

In preparing the seed bed I use an iron corrugated roller to advantage if there are many clods. I consider the corrugated roller one of the best implements on the farm.

Very respectfully yours,

S. MILLER.

Unionville, Mo., April 20th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—I am of the opinion that, but few farmers realize the importance of the properly prepared seed bed, and a good many who do realize it, do not put it into practice. Many of us make noble resolutions in December but fail to carry them out in May. I have seen many farmers plow sod in the spring, disc and harrow once, and *plant twice,* (the first planting did not come up), with the natural result that the corn-pens were slim in the fall.

I know of a farmer who did not work sod ground this last year, until time to plant. His reasons were, that the season had been wet the year before and the plowed ground was better if left alone. But this season was dry, with the results that this field on sod made only ten bushels per acre. It is always safe to work sod ground down, and the drier the season is, the more work will be needed, and the better the work will pay. Sod should be disced from two to four times, depending on its toughness. I disced one field four times this year, and there is no doubt but that it paid me. I use the disc and harrow in preference to the drag. If the ground is not too wet, I harrow the corn after it is planted. It pays to buy good seed corn of a reliable breeder. PEARL FIFE.

Mr. Fife is a breeder of pure bred O. I. C. SWINE.

Atoka, Oklahoma, April 22nd, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—I am somewhat surprised and pleased to see that Illinois farmers ask advice from an Oklahoma farmer in regard to growing corn. The methods I follow would not be well suited to Illinois conditions, but they are practiced by the most enterprising farmers in all sections when there is a deficiency of rainfall.

As soon as the corn is gathered the stalks are cut and the ground listed up with a fourteen-inch lister and subsoiled with a long, shallow plow. After plowing, the ground should be let alone until spring.

When I am ready to plant in the spring I relist, subsoil and plant.

For the first cultivation I use four long calf-tongue plows and plow good and deep. The next plowing I use shovel plows. I lay by with a disc cultivator when the corn is about waist high.

Yours truly, DUTCH JONES.

Luray, Mo., April 19, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—Yours of recent date received in regard to corn raising. I have a light rolling soil which I plow in the spring if it is stalk ground. I think spring plowing will produce a bigger crop than fall plowing, since the ground does not run together badly. Since this is a shallow soil I generally plow about four inches deep. I never burn stalks when corn follows corn, but drag them down and plow them under, since they prevent the soil from washing on rolling land and help to keep up the fertility. I use split log drags and tooth harrows for working the ground down after plowing. I plow all the ground that I plant to corn before planting any, usually drag or harrow the ground twice before planting, and then harrow after planting before it comes up. I never harrow corn after it is up. The corn is usually three or four inches tall when I cultivate it the first time. I use six-shovel cultivators and I consider them the best, all things considered. I cultivate three times and the corn is usually from two to three feet tall when I lay it by. Yours truly,

A. L. PORTER.

Kentland, Indiana, April 12th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—The soil in this community is a black loam, with just a little sand. It is nearly level, and well drained.

I generally plow my oats stubble in the fall. I try to plow between seven and eight inches, and not lay the furrows too flat, as this ground has a tendency to run together. I like early plowing as it is generally dry and plows up lumpy, so that when the time comes to prepare it for corn, it is mellow, and works up fine.

In the spring as soon as the oats are sowed I take the spreader and top dress all the spots that I know to be thin. As soon as the manure is spread, I start my solid-wheel disc, generally crosswise, the way it was plowed. Just as soon as I get it disced once, I change to the spader and go the long way, and follow with the harrow. This puts the ground in fine shape, if we have an average season, but I found it necessary to disc my ground four times last year, and I am sure it paid. I generally follow about a day being the harrow with my corn planter. This gives the top of the ground time to dry off, and you don't have to use scrapers on your planter. I aim to plant two

grains to the hill, and three by six each way. As soon as I finish planting, I harrow the field crosswise, and as soon as the corn begins to come up, I harrow it the other way. I do not wait for the corn to get a given height, but put in my eight-shovel eagle claw cultivator and walk, as I don't believe a man can do as good a job riding. I believe if you do not get up to the corn the first and second times and get the weeds out of the hills, you will have weeds in the fall. In this section of the Corn Belt, the use of all surface plows, from the first, I think is a mistake, since the rains beat the ground down, and it requires the shovel plow to loosen it. The small cultivator gives you plenty of mulch so that when you use your gophers you can do a good job. I use Tower Surface Plows the last three times. I always run them deep enough, so that there will be loose dirt falling over the shovels at all times. If you don't do this you are bound to have weeds between the rows. The last plowing the corn ought to be about four feet high and I run my shovels just deep enough to get the dirt up to the corn, and I figure on getting it layed by about the 4th of July.

HENRY DUTTENHAVER,
R. F. D. No. 1, Kentland, Indiana.

Wheatland, Indiana, April 14th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—I will give you my experience as a farmer on corn culture.

Preparation of Seed Bed for Corn

Soil: My soil is what is known as white oak ridge soil, a mixture between clay and loam, which will produce most any kind of grain and hay. It is somewhat rolling, which forms a natural drainage.

I think the best time to plow stalk ground is in the spring, because freezing and thawing injure fall plowed soils in our locality. We always strive to build up our soil in every way possible for the production of a bountiful harvest. I have always had better success growing crops on spring plowed stalk ground than on fall plowed.

I plow six or seven inches deep for corn, and would prefer twelve inches if I had the power to do the work. By plowing deep, you have a deep soil which is necessary for a good corp of corn. The old adage, "Plow deep while sluggards sleep and you will have corn to sell and to keep," is certainly true.

Farmer friends, don't burn your cornstalks or your straw, both are very valuable. Take your disc harrow and cut your stalks and see how nicely they will plow under, by using a jointer on your plow. We always plow the cornstalks under, because they are of great benefit to the soil, by making it loose and porous, so the air can penetrate and restore the plant food properties.

The implements used in preparing the seed bed depends largely on the weather conditions. If the ground has become packed, use a disc harrow, then, if dry and cloddy, a drag or roller should be used, followed by a section harrow. Sometimes two or three harrowings are necessary, and if weather conditions indicate dry weather, I run a light drag before the planter, if not I plant after the harrow. I never prefer working down early plowed ground, because it becomes more or less compact and requires more work to make a good seed bed.

I plant my corn with a "Black Hawk" corn planter (the drill type), using furrowing shovels or eveners to regulate the depth of the corn, and by using good seed corn I am almost sure of a good stand of corn.

If it comes a heavy rain immediately after planting, I use a section harrow before the corn comes up; this breaks the crust, and thus prevents the tender corn from crooking and losing most of its vitality. After the corn has all come up in good shape, and the weather is dry, I start the roller, which pulverizes all remaining clods, then a section harrow is used, which leaves the ground in a very fine condition.

If possible I like for my corn to be three or four inches high for the first cultivation, at which time I cultivate about four inches deep and as close as possible. This stirs the soil well around the corn-roots and starts it to growing. I use a six-shovel cultivator for all the cultivations excepting the last, for which time I prefer the disc cultivator. I consider this implement the best for the last cultivation.

I set the disc next to the corn very shallow and far enough apart to plow all of the middle. By cultivating about two inches deep, this method will make a nice, loose mulch of soil for the corn-roots to get their nourishment from.

I cultivate as many times as the corn will permit the use of a cultivator, then if the weather is dry I use a one-horse harrow to keep up the action of the moisture.

If the farmers of this country would be more careful in selecting their seed corn the yield would be much better.

A. H. MYERS.

Arthur, Illinois, April 15th, 1913.

Mr. W. T. Ainsworth, Mason City, Illinois.

Dear Sir:—The farm I am farming is gently rolling, and the soil is a brown silt loam. I have obtained the best results by plowing sods in the fall, but when corn follows corn I have found, from experience, that the biggest crops can be raised from spring plowing.

I am firmly convinced that the burning of stalks is a bad practice, since it robs the land of nitrogen and humus. Before plowing, I double disc all the stalkfields, with a Janesville spading disc. I plow from six to seven inches deep, and the early plowed ground is allowed to stand until after heavy rains, before any further work is done to it. For the later plowed ground, I use a rotary harrow on the plow. This pulverizes the soil and levels it up as it is plowed. Each day's plowing is again harrowed down in the evening, when it is allowed to stand until nearly planting time.

After the corn is planted, it is rolled and harrowed and left until the plants are about four inches tall, when it is cultivated about four inches deep with a shovel plow. For the next two or three plowings I use a surface cultivator and get over my corn as many times as I possibly can. I lay my corn by when it is from three to four feet tall. In closing I want to say that I consider the spading disc one of the best implements on the farm. LEWIS D. YUTZY.

Mr. Yutzy is a stock raiser, as well as a farmer.

Laurel, Iowa, April 10th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—The nature of my soil is a black loam with clay subsoil, nothing better for the growing of corn. I do not like fall plowing for stalk ground, since the winter and spring rains pack it so badly that it requires more work to get it in shape in the spring than it does when the plowing is allowed to go until spring. I believe that spring plowing of stalk ground will bring larger yields than will fall plowing.

I break the stalks down, rake them up and burn them. I next run a good sharp disc diagonally across the field and harrow. This leaves the ground level, makes the plowing easier and leaves the field in much better shape than where the discing is not done before plowing.

I harrow each evening what I plow during the day. When I get ready to plant I harrow the field once or twice, according to the shape

the ground is in. I run the disc directly ahead of the planter. With an average season this method gives me a good seed bed.

I plant three feet eight inches by three feet six inches, and drop three grains to the hill. The corn is planted deep enough to place it in moist ground. I harrow as soon as the corn is planted and again after it is about through the ground. I seldom harrow corn after it is all up, since a number of hills are broken off and otherwise injured. I use a surface cultivator altogether and use the drags or floats the first time over. I cultivate from four to five times, depending on the condition of the soil. I consider the surface cultivator the best. It holds the moisture better and if it is properly set it will move every inch of the surface soil. I plow my corn until it is so tall that I cannot get through the field without injuring it.

Yours for success, C. C. PAUL.

Mr. Paul is a grower of pure bred Chester White Hogs.

Pimento, Indiana, April 11th, 1913.

Mr. W. T. Ainsworth, Mason City, Illinois.

Dear Sir:—Our land is a heavy, cold clay and very level. We always plow the stalks under in the spring, since it makes the ground looser, adds fertility and makes the crop more easily tended. The ground is broken six to seven inches deep. Our method of working the ground depends entirely on the season. On dry, cloddy ground we use a wood drag, on nice loose soil, a harrow, and on sod, a disc harrow.

We get our ground level and smooth before planting, and plant from two to two and one-half inches deep. If the weather is dry, we harrow before the corn comes up. If it is wet we leave the field alone until we can plow the corn, which is done as soon as it is possible to plow and not cover the hills. We cultivate from two to three inches deep straight through the season. We use disc cultivators altogether, and consider them the best in our soil. We cultivate three to four times, and stay with it until the corn is too tall to plow with cultivators.

R. F. D. No. 1. GEORGE M. CUTINGER.

Girard, Pa., April 28th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—In answer to yours of recent date, as to culture of corn will say that for corn I prefer a one-year-old clover sod which has been manured the previous winter and plowed as early as possible after oats

seeding. The ground should be plowed to a depth of about six inches, rolling down every evening what has been plowed that day and following up with a spring-tooth harrow or disc pulverizer. The field should be gone over with these implements until a perfect seed bed is obtained. I use a light roller immediately before planting and follow with a two-horse planter with an open wheel planting about twelve inches for silo and sixteen inches for husking.

The third day after planting I use a smoothing harrow with teeth set slanting and go over the field again about the sixth or seventh day after the corn has the second leaf. Next I use a flat-tooth round point weeder, going over the field about twice or until the corn is large enough to use a two-horse cultivator with shields to keep dirt from rolling on the corn. I follow the first plowing with the weeder, running crossways, after which I cultivate about three times more during season with the shields removed from the cultivator. The first cultivation may be about three inches deep, after that from one and a half to two inches is deep enough. I also use from two to three hundred pounds of fertilizer analyzing about 1—8—4. We harvest with a corn binder previous to silo filling, leaving it lay as the machine drops it for two days. If it is husked it is set up in shocks a second or third day after it is cut. In our latitude we like to plant between the twentieth of May and the first of June, if corn is put into the silo.

Yours truly, JOHN A. BAUSCH.

Mr. Bausch makes a speciality of selling butter, eggs and pork direct to the consumer.

Greenfork, Indiana, April 15th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—In this community most of the land is a white and red clay, except where the ravines course along, but there is a good deal of black ground, too. The land lays practically level, although nearer the river it is a little rolling.

I do not plow my stalk ground at all in the fall and do not want much for spring plowing if it can be helped. With the exception of new land we follow mostly a rotation of corn, wheat and clover. I like to plow my ground five to six inches deep. If I had the machinery I would always cut the cornstalks and plow them under, because I believe it would loosen and enrich the land; as it is I find it necessary

to burn them. I use the spring-tooth harrow on sod ground for the first harrowing, then follow with spike-tooth harrow until I get the ground in condition to plant corn.

The corn is planted two to three inches deep. I like the idea of harrowing the corn before it comes up, but I could never get accustomed to harrowing after it has once come up. The harrow teeth drag out too many hills of corn.

I don't think it practical to plow very deep for the first cultivation. By the way, I do not think much of deep cultivation at any time. I like the shovel cultivator the best of any I have ever tried.

I always plow my corn at least three times and a fourth cultivation is very good if one has the time. Most of the corn in this community is fed to hogs with the result that the land is getting more fertile each year.

I shall be very glad to get your book on corn culture.

Yours truly,

HERBERT H. HOWARD.

Oblong, Illinois, April 15th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—As I have received a request to give my experience in growing corn, I will endeavor to answer as best I can.

Soil: The soil I am farming at the present time is of the heavy kind, such as is most of the land in this section that was timbered with water oak hickory and white oak.

I am located in St. Marie Township, Jasper County, east of St. Marie, near the east line. This land is level and not the best for wet seasons.

I do all my plowing in the spring, since fall plowing will pack too much and the weeds would start before time to plant. Spring plowing is always best for my kind of soil, since it should be dry and not have too much rain after plowing. I plow my ground about four to six inches deep and aim to leave some of the top soil undisturbed. Following corn I always use a stalk cutter and cut the stalks so that they do not interfere with cultivation. Plowing stalks under helps keep the ground loose below and gives it air. To work ground down I use whatever is required to get it in shape and do good work. On ground that is rough and uneven I use a drag to level, followed always with a harrow, since otherwise it will get weedy before the corn is big

enough to cultivate. I always work ground just before planting, so that it will be clean and let the corn get ahead of the weeds. I generally plant corn twenty inches apart in the row, and the rows are forty-two inches apart. I drill corn because we plow in lands that contain from eight to ten rows. I harrow corn before it comes up: in case the planting was done in rough and cloddy ground, I harrow corn after it is up, unless it is big enough to cultivate before I can use the harrow. I want corn to be about three or three and one-half inches high before I cultivate the first time, as I want to plow close and deep and cover all little weeds and put just a little dirt around the corn I plow about three inches deep and set fenders as high as possible, to allow some of the dirt to drop around the corn plants.

When laying corn by I plow deep enough to turn over and clean the row, but I stay away from the corn and take the middle all out. I use shovel and disc plows. I always use shovels for first plowing. The disc leaves too much ground undisturbed and the weeds grow more quickly in the row than where plowed with shovels. I consider shovels and discs best for this soil, since surface cultivation leaves the ground too hard after a heavy rain. I try to cultivate my corn three or four times and do if I am not delayed by rain or other work. In laying corn by I have no set height or time, but plow when the ground is in good mellow condition. I often plow my corn the last time when it is three and four feet high. If I am delayed by some cause or other I have laid corn by, with good results, when it was tasseling out.

CHAS. J. KERNER.

St. Croix, Indiana, April 28th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—My farm is located in Southern Indiana in the northeastern part of Perry County. Our land is a light clay loam soil and inclined to be rolling while some is level; too level. I never follow corn with corn, nor can anyone here and make farming pay.

I bought my farm about twenty-five years ago. At the time I bought it, it was considered a run-down farm and would not grow ten bushels of corn per acre. Today I have no trouble in growing fifty to sixty bushels per acre. I have brought this farm to its present state of fertility by a rotation consisting of corn one year followed by wheat, oats or cowpeas, then with clover and pasture.

In this locality we plow early in the spring if the weather will

permit, which is very seldom. It is not advisable to plow our hilly ground in the fall, since it would wash too badly during the winter and early spring. I think corn land should be plowed from six to nine inches deep, since it holds the moisture better than shallow plowed land. I usually cut the corn up and feed the fodder, but if I have any stalks left I cut them up and turn them under.

My corn ground is usually a sod clover or pasture land. After breaking I drag, then disc, drag again and harrow. The early plowed fields are not usually worked down until nearly planting time, but the late plowed fields should be worked down as soon as they are plowed to keep the ground from becoming cloddy and to retain the moisture.

I like to plant corn between the first and tenth of May, but of late years spring rains have delayed planting until later. I plant with a two-row corn planter, using commercial fertilizer at the rate of one hundred pounds to the acre. Cultivation should begin as soon as possible after the corn is up, and I like to harrow before the corn is up, but if it rains after it is planted it is generally up before the ground is dry enough to justify getting on with the harrow. As soon as the corn is up I go over it with the harrow once and sometimes twice. When the corn is about three inches high I commence cultivating with a two-horse cultivator. I plow deep the first and second times over; setting the cultivator so that it will not throw much dirt to the corn. The later cultivations are shallow. I always follow the cultivator with a one-horse harrow which runs between the rows, here we use the shovels since the disc leaves too uneven a surface. I always try to leave the surface level after each cultivation. I cultivate from four to six times, or as often as the weather will permit. T. B. LYONS.

Buckley, Illinois, April 9th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—In answer to your letter of the 8th inst., I will give you my method of preparing ground for corn. For several years past I have been sowing from forty to eighty acres with clover in oats. I let the clover stand until the second year to enable it to make the necessary root growth from which a large part of the benefit to the soil is obtained. If there is not much seed in the second crop of clover, I plow it under to enrich the land. I prefer fall plowing of clover sod in preference to waiting until after oats sowing is over. In the spring I go over the fall plowed ground with a disc, cutting full depth.

This loosens and mellows the soil besides letting in warmth. It will also start the first crop of weeds to growing. About the tenth of May I go over the ground again with the disc and kill all these sprouted weeds. I now give the field one or two good harrowings and plant. The corn is always harrowed again before it is up. In preparing stalk ground I prefer to plow it in the fall, but one seldom gets this chance. By all means leave the stalks to be plowed under. Why? Because anything that will decay in the soil makes humus and humus is what we need to keep our soil loose and mellow. My method of getting rid of the stalks is to go over the ground both ways with a disc. This cuts the stalks up and also makes a mulch of loose soil to have on the underside of your furrow slice. Disc your soil again after the plow before the clods have time to dry and you will have no clods, since the furrow slice has been completely pulverized. For spring plowing I think four inches is deep enough, but for fall plowing seven or eight inches is better.

Our soil is level, black loam and comparatively heavy. My aim is to have a carload of cattle to sell every year and thus with their help I improve instead of impoverishing the soil.

Yours truly, CHARLES HOLZ.

Rushville, Illinois, April 10th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—Replying to your request for our methods of corn growing, I must suggest that what I can say will be of little interest and small value. I devote my best thought to apple growing.

Where corn follows corn, we cut the stalks up fine with a sharp disc and thoroughly harrow down the land, then plow about six to eight inches deep. We then harrow the land, furrow off three and one-half feet wide with large shovel plows, and drill eighteen to twenty inches apart in row.

Our lands are both black, loam bottom and loose formation upland. I never plant two successive crops of corn on upland, and very rarely on bottom-land. I use similar methods in preparing the ground on all these soils.

We never plow stalk land in fall as the crop is not removed in time.

I believe stalks should never be burned as they do not interfere with cultivation, when properly cut up, and on upland they help to prevent the land from washing and also return some fertility to the

soil. If the corn is infested with insects or with fungous disease, I burn the stalks.

We harrow down after plowing and if the land becomes hard we disc and harrow before planting. This method eliminates clods. If we use barnyard manure we spread late in the winter or early in the spring and plow it under.

I strongly advise the rotation of crops as the best method of returning the fertility and destroying insects and diseases.

Cultivation: I generally harrow when the corn is up three or four days if the ground is in proper condition. I believe corn should be cultivated as small as possible and frequently. The first cultivation generally is shallow to avoid throwing much dirt on the small corn. For biggest yields, corn should be plowed every five to eight days. I run inside shovels shallow when laying by, but turn outside ones in, thereby throwing dirt strongly to corn. Either class of cultivation is equally good if properly used. Have had better results laying corn by with ten-inch diamond plow, but it leaves the land rough. I disc clover land before plowing and believe all lands should be disced before plowing. We have obtained good results when we cut corn by sowing thickly in wheat or rye and pasture during the winter with horses, cows and pigs, then in the spring disc and plow. Have grown fine crops on small lots treated thus. I sometimes turn hogs in a field in August and believe fertility can be longer maintained by this method than by any other. B. F. STUART.

The growing of apples is Mr. Stuart's specialty.

Eddyville, Iowa, April 10th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—In answer to your letter of recent date I will give you my methods of growing corn. These methods, I believe, are the best for southern Iowa.

Our soil is a light, black loam, underlaid with a porous yellow clay subsoil. Being a warm, well drained soil, it is adapted to the growing of varieties as late in maturing as one hundred and ten days.

We prefer plowing stalk ground in the spring, in order to get the benefit of the stalk pasture, although we consider fall plowing is better, since the ground works up better, which, of course, means better yields. In the spring we get in the fields as soon as it is fit. The ground is disced before plowing. This forms a dust mulch, and

when the furrow slice is turned over, capillarity, which was destroyed when the furrow was turned, is quickly re-established, since the dirt on the sub-surface is pulverized and not cloddy. As soon as the ground is plowed it is harrowed. This forms a dust mulch, and prevents the moisture in the ground from escaping. We harrow the plowed ground after each rain, as soon as it will do to get in the fields. By doing this the moisture is conserved, and no crust is allowed to form up to planting time.

Our spring plowing is from six to eight inches deep. We plow ten inches deep in the fall, and aim to turn all our new ground at this season of the year. Freezing and thawing during the winter months, followed by early spring discing, puts this deep plowing in ideal shape.

We are cranks on conserving moisture and our efforts along these lines bring us big returns in the fall when we husk our corn. Gentlemen, the farmer can not take too much time in the preparation of the seed bed for corn. Of all the grain crops grown, corn is the one that responds the quickest to thorough preparation before putting the seed in the ground. We believe that a forty-acre field, properly prepared, will grow as many bushels as eight acres plowed only three or four inches deep, and left to dry out until planting time. Practice thorough cultivation and plant pure bred seed corn, and you will be well paid for your time and money spent.

As soon as the seed bed is as good as we can make it, we start planting. We check three feet six inches each way, and plant from one to one and one-half inches deep. The field is harrowed as soon as planted in order to kill the small weeds and sprouted weed seeds. We do not feel justified in harrowing after the corn is up, since the harrow teeth break off and cover too many hills. Since we only plant two kernels to the hill, it is necessary that they should all grow.

We start cultivating rather deep when the corn is from four to six inches high, and make every effort to kill all the weeds at this plowing. The second cultivation is not so deep, since by this time the corn-root system has extended in all directions.

When we "lay the corn by" we throw up a small ridge, but are very careful not to cut many roots. During the first three cultivations we use four-shovel plows. For a fourth cultivation we use an old mower wheel and run it between the rows. This conserves the moisture, and helps in getting a larger yield.

We think the shovel cultivators are the best all-around cultivators you can get. At the same time surface cultivators are coming into

use more each year, and on level ground they do fine work, but I believe I can do as good a job with a four or six-shovel cultivator. In my opinion the shovel plow stirs the ground better than the surface cultivator.

We lay our corn by when it is about waist high.

Every Corn Belt farmer should practice thorough preparation of the seed bed, should give his corn careful and frequent cultivatings, and above all else, plant strong, vigorous, pure bred seed.

Yours very truly,

HENRY J. LANGSTRAAT & SONS.

Growers of Reid's Yellow Dent and Johnson County White corn, and Swedish Select and Silvermine oats.

Delaplaine, Ark., April 12th, 1913.

Mr. W. T. Ainsworth, Mason City, Illinois.

Dear Sir:—The nature of our soil is a deep sandy loam and is very level. I always plow my stalk ground in the spring, although fall plowing might be better. The plowing is done from six to eight inches in depth and the stalks are cut and turned under. I work my ground down as soon as it is plowed and harrow at frequent intervals until time to plant.

The common method of planting in this country is with a single-row drill, but of late years I have planted by hand and checked the rows. I harrow the corn after it is about three inches high and cultivate four or five times. It is laid by when six or seven feet tall.

Our corn makes from forty to eighty bushels per acre, depending on the season and the care the crop has received. I shall be very glad to receive your corn book. Yours truly,

G. W. CLAYTON.

Hughesville, Mo., April 11th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—I am writing you to answer your questions in regard to my method of preparing the seed bed and cultivating the corn crop.

Although I have a black, heavy rolling soil, I would rather have the stalks plowed under in the fall or winter, if it is possible to get the plow in the field. If the plowing is done in the spring, it should

be as deep as six or eight inches and started as soon as the frost is out of the ground, provided the ground is dry enough.

I consider it a bad mistake to burn stalks. They should be cut with a disc harrow and plowed under to root and help hold the moisture.

If the ground is well disced before plowing in the early spring it should not be harrowed or worked down before time to plant.

Planting and Cultivation

If the ground has been plowed in the fall or early spring and has settled or run together into a hard compact mass, it should be double disced. By this I mean the disc should be lapped half each time. This method does away with the furrow or ridge and leaves the ground level. I finish up by using a smoothing harrow. I precede the planter with the furrowing machine.

This machine consists of two fourteen-inch single shovel plows, set the same distance apart as the width of my two-row planter runners. The planter follows and runs in the middle and bottom of the furrows. By using this machine my corn is planted in furrows. I run the disc, smoothing harrow, and furrowing machine all the same way, so that one implement does not have to finish its work before the other is started.

The planter should not start until the furrow has dried enough so that the fresh dirt in the bottom of the furrow will not stick to the runners or planter wheels, but will have a dust mulch over the corn rows. I use good seed and get a good stand, unless the fields are flooded with heavy rains before the corn gets well sprouted.

As soon as the corn is up enough to insure a good stand, I start a light smoothing harrow, and if the weather is favorable I harrow two or three times before starting to cultivate. If the season is wet I do not use the harrow, but start cultivating as soon as the corn is up well enough to see each hill down the row. I start with a six-shovel cultivator and plow as deep as the shovels will reach, which is about four inches.

I plow my corn as many times as I can before it gets big enough to bend under the cultivator arch. The last plowing should not cut many roots; at the same time it should be deep enough to make the shovels throw the dirt well up around the butts of the stalks.

S. E. HARVEY.

Jacob, Illinois, July 30th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—The soil on our farm is level and light. I plow the stalk ground in the fall. I think that is the best time for the land and gives the biggest crop. The stalks are cut and turned under when corn follows corn. I believe it is better for the land and adds nitrogen to the soil. In working the ground down after plowing, I use the drag and harrow. The early plowed fields are harrowed down when first plowed.

In planting the corn I check in hills with two or three grains to a hill, and harrow before it comes up; also harrow after it come up. When the corn is about four inches tall, I bar it and after a few days go over it again, throwing the dirt back. I cultivate about four inches the first time over and plow shallow enough to get the dirt when I lay by. My cultivators are discs. These I consider the best. I cultivate about four times. The corn is about sixty inches high when it is layed by. Respectfully yours,

JOHN W. CUPP.

Green Valley, Illinois, April 20th, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—I am writing this letter to answer your questions in regard to preparing the seed bed for corn. I have sandy loam, clay and heavy black loam. These three kinds of soils all require different handling.

Since the stalks contain a large amount of humus and some nitrogen, I cut them and turn them under on all the light soil. On the heavy soil I burn them, since they grow so rank that they would bother during the later cultivating. This heavy soil does not need the humus in the stalks so badly, although they would undoubtedly help the ground.

A good plan is to cut the stalks and break the ground deep in the fall, but since I am a stock farmer and need the stalk fields, I do most of my plowing in the spring.

I plow from five to seven inches deep, depending on the nature of the soil. In working the seed bed I depend mostly on the harrow, although I find, at times, it is an advantage to use the disc harrow and the Bailey and Nichols clod crusher. This is different from others, as it acts as a harrow and packs and breaks up the clods.

Unless the season is very wet, I harrow down the early plowed fields, and do not allow them to stand until time to plant the corn.

Corn Cultivation

I use a check-rower planter and plant three feet four inches each way, and two grains in a hill. I do not harrow corn before it comes up, unless I think it will get weedy. I harrow the corn after it is up and a good size. I let the corn get a good height before plowing the first time. This enables me to plow close to it, and the first plowing is what counts. I plow rather deep the first time over, but when I lay it by I plow as shallow as I can and kill the weeds.

I use six-shovel riding cultivators, and twelve shovels on the two-row cultivators. I prefer the two-row cultivators, if I have large fields with no point rows. My sons all use two-row cultivators, and do as good a job with them as they could with the single row. Those who have never used a two-row cultivator will perhaps doubt the statement until they have tried them for themselves. I cultivate as many times as I can; three or more. I lay my corn by as tall as I can without breaking it down.

Hoping I have answered your questions, I remain

Respectfully yours,

W. L. WOODROW.

Mr. Woodrow is a breeder of full-blooded Percheron horses.

Bolivar, Missouri, April 24th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—Our soil is not the most fertile soil in the world, but at the same time good management and a careful rotation of crops will bring good yields.

I usually grow corn on ground that was in wheat the year previous. I plow the wheat stubble deep, (six to ten inches), in the fall and winter when the weather is cool. I then leave the ground until planting time. In preparing my ground for planting I double disc with a sharp disc and harrow the ground at least twice with a spike-tooth harrow. I never drag my fields, since a big rain will cause the weeds to grow too quickly. I use a John Deere planter, and drop alternately two and three grains to the hill. I apply one hundred and twenty-five pounds of bone and potash fertilizer with a fertilizer attachment on the planter.

The corn is harrowed once or twice before it comes up. I plow my corn at least four times with four and six-shovel plows. The last cultivating is given the corn when it begins to tassel. About silking time I plow between the rows with a five shovel, one-horse cultivator. When it is necessary to plow in the spring, where corn follows corn, I prefer to plow as early as possible, since early plowing is not affected so much by a dry spell in July and August. I never, under any circumstances, burn any stalks. This is a ruinous practice with us, and I believe will do more harm than good in any country.

Yours truly, JOHN L. NOVAK.

Mr. Novak is a breeder of Poland China Hogs.

Senath, Missouri, April 25th, 1913.

Mr. W. T. Ainsworth, Mason City, Illinois.

Dear Sir:—In reply to your letter of the 8th, I will say that I just haven't had time to spare to write you in regard to my method of preparing the seed bed and growing corn.

To begin with, the soil here is a light level soil. We plow our stalk ground mostly in the spring, as we sow peas in the cornfield at laying by time. I think it best for the land and also for the following crop to plow in the fall, but because of the fact that I depend on stalk fields for pasture until winter or early spring, it is impossible for me to plow in the fall. I plow my land from seven to eight inches deep and I think that is deep enough for this land. I cut my stalks and plow them under because that and the cowpeas are all that we have to keep our land up. The first thing I do in the spring is to cut the stalks and disc the rows down; then I turn and cross disc again before plowing. If I plant at once I run a three-horse section harrow and plant, but if the ground is not planted at once I don't harrow, since the winds will blow it so bad. If the ground is allowed to lay for some time before planting, I double disc to kill the weeds and harrow with a drag harrow before planting. I plant with a two-row drill, three and one-half feet apart, and set to drill the two rows from twenty to thirty inches apart, owing to the richness of the soil. I used to plant thick, and later thin out every other stalk, but I have quit this because I can't do all the work myself, and if one plants too thick he generally does not thin enough. Of late years I have planted for a stand, and I usually get plenty of corn, in fact, if you get your land in good condition for the seed, there's no likelihood of

getting a bad stand. I think the majority of us, in southeast Missouri, get in too big a rush and don't get the land in proper shape for planting and plant before the ground gets warm. I think, as a rule, the last of April and first of May is early enough to plant corn. If I can possibly get the time I run the harrow over the land before the corn comes up, and as soon as it gets high enough so that I can plow with the cultivator and fenders on, I begin plowing the first time. The first time over I plow about five inches deep and try to get shallower every time till I lay it by. The last cultivation is with a disc run very shallow. I do most of my cultivating with small shovels and I really think they are best. I begin, as I said before, as soon as the corn will permit and cultivate every week until it is too tall to plow. I average plowing from six to eight times with the cultivator and generally lay by when the corn is four to five feet high. I don't use any special implement, since I don't go over the corn after laying it by, because I sow peas and soy beans in the cornfield. These nitrogen crops pay in more ways than one. First, the land gets the benefit of the roots, and second, it helps to keep up moisture. It also keeps the weeds down and the pasture is worth just about as much as the corn crop.

Now some would think that we ought to sow more of our land down, but the most of this land is too sandy to grow clover or similar legumes. For this season we cannot practice a rotation of crops like is done further north. I remain

Yours truly, E. B. WALLACE.

Mr. Wallace makes a specialty of the growing of pure bred O. I. C. swine.

Hartville, Missouri, May 2nd, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—In regard to corn growing I will write you to the best of my knowledge.

In preparing my seed bed for corn I turn with a breaking plow, then drag and follow with a disc harrow, then drag again. Before starting to plant I plow out furrows, three feet eight inches apart, with a cul-

NOTE: The writers of this book have three hundred and sixty acres of land in northeast Arkansas. Our farms are about fifteen miles from Mr. Wallace's and the soil is very similar to his. Mr. Wallace tells a big truth when he states that cowpeas or soy beans should be planted between the rows of corn. We furnish soy bean seed to our tenants on these farms to encourage them in the growing of this legume.

tivator. In these furrows I plant the corn. I sometimes cultivate the corn before it comes up with disc cultivator by throwing the dirt from the corn, then let it come up and get three or four blades on it, then follow with a shovel cultivator. I cultivate two or three times, then for the last plowing I use disc cultivators, set to throw the dirt to the corn. After this last plowing I leave the field until time to harvest the crop.

Our soil is heavy and level. I plow the stalk ground in the spring. The ground should be plowed five to seven inches deep, owing to the soil, and the stalks should be turned under because it adds humus to the ground. I use drags and disc harrows to work the ground down after plowing. I let the early plowed fields stand until I am ready to plant before harrowing down. Sometimes I harrow before the corn comes up. In dry weather I harrow and roll after the corn comes up and the first time it is cultivated I plow from four to six inches deep. When I lay by I plow from two to three inches deep.

Yours respectfully, MARK MITCHELL.

Xenia, Ohio, April 14th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—Our ground is a rather heavy clay soil, with spots of black ground scattered around over every field on the farm. It is level, and not being underlaid with sand or gravel, most of it needs tile. We have considerable tile laid, but there are several places where more would be of benefit.

While we have never tried plowing for corn in the fall, I believe a heavy sod that is not rolling enough to wash, would do better than if plowed in the spring. One of our neighbors tried this, and was very successful. Where the ground is exposed in this way throughout the winter, some of the fertility may escape, but I do not believe there would be enough to offset the advantage to be gained by the conservation of moisture, especially if the season was dry. Then, too, the sod has a chance to rot and is ready for the corn as soon as it begins to grow. We try to get our sod plowed as early in the spring as possible, and I think we shall experiment some with fall plowing, since that is the only way to find out anything.

We prefer to have the ground plowed seven or eight inches deep and not worked when it is too wet. We do not aim to follow corn with corn, but when it can't be very well helped, we burn the stalks

as we have no cutter. The stalk ground is always plowed last, for the reason that it does not get tough like sod, and usually does not get dry so early in the season.

We use a common spike-tooth harrow and drag made of four-by-four's set on edge. These are started just as soon as the ground has been plowed. If it is pretty well beaten down by rain, a spring-tooth harrow is about the best thing to loosen it with; then follow with the spike-tooth to level the ground. I never put any work on early plowed ground until I am ready to plant, and then I keep the planter as close behind the harrow as possible.

We find that a good clover sod with hogs fed on it, and manure scattered over it will come as near raising one hundred bushels of corn to the acre in any kind of weather as anything we have ever tried.

W. H. MORGAN.

Stanberry, Missouri, May 2nd, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Dear Sirs:—The soil in the northwest part of Gentry County is a light, black loam and is somewhat rolling.

In regard to the time of year to plow I will say that I prefer fall plowing when it can be done. In the first place it is done at a slack time of the year and can be put in good shape for planting in the spring with very little work. Again, it holds the moisture better than spring plowed ground. If I plow in the spring I like to double disc the ground. This will answer for a stalk cutter and at the same time pulverize the soil on top which makes it much easier to plow and makes a good loose bed for the corn. I use a disc frequently and consider it one of the most useful pieces of machinery on the farm as it can be used for so many different purposes.

A great many people rake up the corn stalks and burn them. I do not think this should ever be done. Corn stalks should always be plowed under and all other manure that can be obtained. The stalks when plowed under will help to keep the ground loose.

After giving the ground a good double discing with a good sharp disc I go to it with a gang plow. A harrow should always follow the plow. The ground should not lay long, especially if very dry, as it will not pulverize readily when allowed to get too dry after plowing. The harrow also levels the ground making a loose bed on top to hold the moisture. When ground is plowed early it should be har-

rowed and disced just before planting, in that way will kill all weeds that have started and this gives the corn an even start with the weeds.

I use a check-rower planter fitted with furrow openers. These throw out a furrow in which the corn is planted. The use of the furrow openers insures an even depth of planting, kills all weed sprouts in the row and makes it possible to harrow the corn twice after it is up without doing it any injury.

As soon as the corn is tall enough to plow I start plowing and try to plow after every rain if possible to prevent the loss of moisture. I use six and eight-shovel cultivators in preference to the four shovels.

I generally plow my corn about four times. I believe that a one-horse harrow plow run between the rows after it is too large to straddle would increase the yield from three to ten bushels.

Very truly yours,

S. W. McPHERSON.

Minier, Illinois, April 12th, 1913.

Mr. W. T. Ainsworth, Mason City, Illinois.

Dear Sir:—A few lines in regard to the preparation of the seed bed for corn.

Our soil is black and heavy, practically level, although rolling enough for good drainage. Our stalk ground is practically all plowed in the spring, once in a while we plow some in the fall, if circumstances allow it. We would prefer fall plowing, and think it by far the best, on an average, for either land or yield.

We prefer deep plowing, especially in the fall; seven or eight inches on old ground, once in a while, is not too deep. Five inches in sod is deep enough.

We have discarded altogether the raking and burning of stalks. We always double disc them with a good sharp disc.

After plowing we aim to make a dust mulch as much as possible by discing, spading and harrowing, also a roller or crusher is very good. In order to get this mulch we begin harrowing right after the plow, which we find gives the best results. After we have a good seed bed, the planter follows and is checked three by six inches, or three by four inches, except what we put up for ensilage, which is drilled thick, so as to make good ensilage, as the lighter the stalk the better ensilage.

After the corn is planted three or four days, or later, it is harrowed. Corn may be harrowed after it is up, provided the ground is

in good shape, which will leave the field in nice clean shape when the cultivator is started. The cultivator is started when the corn is three or four inches tall, and plowed four inches deep, on an average, for the first time. The last time over we spread the gangs, and do not plow so deep for fear of pulling up thousands of little roots, which would injure the corn.

We have never used discs or surface cultivators. Six-shovel plows are all we use; however, we think the surface plows and discs are good.

My corn is plowed three times at least, and five times would be better. The corn is layed by when about two and one-half to four feet tall. Yours truly, C. C. S.

Prop. of Fair View Farm, Minier, Illinois.

Piper City, Illinois, April 11, 1913.

W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—In answer to your letter I will say that my soil is a dark sandy loam and very level. My rotation is corn, oats and clover. I try to have an equal amount in corn and oats.

I plow my ground in the fall about seven inches deep and let it stand until spring. Before planting I usually disc twice and drag. I plant deep then drag again. I also run the drag over the field before the corn comes up.

If I brake stalk ground I disc before and after plowing.

The first cultivation I give the corn is with a six-shovel plow. This cultivation is about four inches deep. I lay the corn by with a surface cultivator and plow deep enough to have considerable loose dirt run over the blades.

Hoping this will be satisfactory, I remain,

Yours truly,

JAMES T. SULLIVAN.

Delavan, Illinois, April 15th, 1913.

Messrs. W. T. Ainsworth & Sons, Mason City, Illinois.

Gentlemen:—Our land lies in Logan and Tazewell counties, Illinois, and ranges from a heavy black loam to a rather light sandy loam. On all the farms I insist, wherever possible, that the corn stalks shall be cut and plowed under, not for immediate results, but for what I am sure will be permanent benefits.

The corn cultivation is usually begun as soon as the corn rows can be followed: I prefer quite deep cultivation the first time over, growing shallower and further from the row as the corn roots spread. We use nearly altogether the shovel cultivators, but I am quite certain the surface cultivators for the third and (if any) succeeding cultivations, would be better than shovels.

Owing to the pressure of other work we rarely cultivate more than three times, as the corn gets too big for later plowings.

I am firmly convinced that we could increase the yield five to ten bushels per acre by breaking the crust between rows after the corn is too big to cultivate otherwise.

Yours truly, W.————————.

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